TASK CONTROL AND DEMAND PREDICTORS OF SATISFACTION AND ANXIETY: A LABORATORY TEST

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ABSTRACT

A laboratory experiment was conducted as a test of the job demands-control model of occupational stress. Four groups of 28 undergraduate students each worked on a creative assembly (kite-making) task with two levels of quantitative demand, and high or low task control. Results showed partial support for the hypothesis that strain (anxiety, dissatisfaction, and physiological arousal) is higher under conditions of low control and high demand. High control increased task satisfaction and reduced anxiety. High demand increased anxiety, and reduced satisfaction ratings on one measure. Objective control moderated the effect of demand on projected satisfaction. Perceived control reduced the effect of demand on anxiety for females. No differential effects were found for pulse rate. Implications for the job-strain model are discussed.

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CHAPTER ONE

INTRODUCTION AND LITERATURE REVIEW

1.1 INTRODUCTION

Occupational stress research has grown over the past two decades, and continues to receive increasing attention and widespread public interest (Mackay & Cooper, 1987). Stress related problems impact on health, satisfaction and factors such as absenteeism, turnover, and lost productivity, which result in direct costs to employing organizations. At any point in time, 30% of the American work force is estimated to suffer from some form of somatic complaint, emotional distress, and psychological discomfort, of these about 10% experience disabling illness (Mackay & Cooper, 1987).

The majority of research on occupational stress has focused on individual characteristics as the cause of strain and illness. This has lead to the development of a vast array of stress management programmes where the cure for stress has almost exclusively focused on the individual (Karasek & Theorell, 1990). The success of such efforts is reliant on changing individual behaviour, personality or biology. Efforts directed at changing the individual are essentially a focus on symptoms rather than underlying causal factors. Evidence suggests the objective work environment is a main determinant of perceptual stress, and a factor in the development of psychosomatic complaints (Frese, 1985). A more fruitful direction for research would be to first examine the contribution of work environment factors in the experience of strain. The Job Demand-Control (JD-C) model is a

person-environment approach that emphasises the environmental contribution to stress-related illness, and strain in the work place (Karasek, 1979).

The concept of stress has been defined and used in a variety of ways. A brief outline of stress approaches is provided, a more comprehensive treatment is available in Cox & Mackay (1981).

Occupational stress has been conceptualised in basically four different ways (Mackay & Cooper, 1987). The stimulus approach views stress as a characteristic of the environment, and as such may be measured objectively. This approach is relevant for environmental incidents such as an accident or exposure to aversive situations. The response approach considers stress to be a physiological change (acute) or disease response (chronic) to external demand imposed on an individual. States of change are considered to impact on behaviour, affect, somatic disturbance (raised catecholamine levels, migraine, palmar sweating), although precise causal pathways have not been delineated. Stress is also considered to emerge from perceptual or cognitive processing and impact on psychological or physiological outcomes. However, research approaches based solely on subjective factors are vulnerable to bias and subsequent misinterpretation (Kasl, 1986). The transaction approach provides a more comprehensive definition of occupational stress. This views stress as a process operating in time, rather than a fixed aspect of the environment or individual response.

Karasek's (1979) Job Demands-Control model (described below) is consistent with a response view of occupational stress. Stress is defined as the alerted state of arousal within an organism, that occurs in response to demand (the stressor). A dynamic component has recently been incorporated into the model delineating the role of the work environment in the worker socialisation (Karasek & Theorell, 1990).

1.2 DEMAND

The concept of demand has been so integral to an understanding of strain that it has often been incorporated in definitions of stress. Selye's (1956) classic model proposed that a combination of demand and individual factors determined the experience of stress. Stress was defined as the nonspecific response of the body to any demand. The person-environment fit model, and conceptions of overload (or underload) also view stress in relation to the level of demand and the ability or resources available to the individual in meeting those demands (Caplan, Cobb, French, Van Harrison, & Pinneau, 1975). Stress is generally believed to occur at both high and low levels of demand (Sharit & Salvendy, 1982). A vast array of demands have been associated with occupational stress. Those examined in blue collar work have included physical demands (e.g. noise, glare, vibrations, cold, heat, alcohol, tobacco), workload, assembly or paced work, information processing (speed, monotony, quality of output), health and safety risks, and job insecurity.

Cooper and Marshall (1978) developed a model of demands relevant to white collar work. This includes factors associated with job characteristics (time pressure, quantitative and qualitative workload), role in organization (role conflict and ambiguity), career development (promotion), organizational structure and climate, interpersonal relations, individual characteristics, and interface with factors external to the organization. However, the inclusion of factors such as responsibility, decision making, and restrictions on behaviour confused aspects of control with the assessment of demand.

Jobs characterised by higher levels of demand have been linked with more dispensary visits, sick leave and early retirement (Frankenhaeuser & Gardell, 1976). Jobs characterised by monotony, coercion and low status jobs

have consistently been associated with low job satisfaction. Occupations with low job satisfaction tend to have higher mortality from heart disease (Frankenhaeuser & Gardell, 1976). A relationship between stress (excess demand) and performance decrements has been demonstrated in defence force cadets (Westman & Eden, 1992). Experimental evidence has found objective work overload resulted in increased serum cholesterol levels regardless of reported subjective overload (Sales, 1969).

Research has demonstrated a relationship between demand and individual factors in the experience of strain. Variables associated with higher strain levels in blue collar work have included age, extraversion, high trait anxiety and locus of control (Sharit & Salvendy, 1982). Individual factors are considered to influence perceptions of work situations, and may moderate the experience of stress. Factors that may influence ability to cope with stress include tolerance for ambiguity, work values, and Type A behaviour (McKenna, Oritt, & Wolff, 1981). An experimental study found perceived job demand was positively related to anxiety and negatively related to job satisfaction, the effects were stronger for `high activity level' subjects (similar to Type A). The satisfaction effect was also stronger for external locus of control (Perrewe, 1986).

Staff reductions in a health care facility led to increased performance demand. Employees reported high perceived stress, and this was found to be an important contributing factor in explaining the high levels of turnover (65 to 70%) among lower level employees (nurse aids, housekeeping and janitorial staff). Higher level employees also reported stress but they did not intend to leave. The separate turnover effects for high and low level workers was explained in terms of degree of professional commitment to the organization (McKenna, Oritt, & Wolff, 1981). However, control was not considered in the study. The low level jobs seemed to be characterised by a lack of control, and this appears to distinguish between the groups. This

suggests that individual factors were introduced prematurely as an explanation for turnover behaviour.

Research has demonstrated that job demands are an important factor in the experience of strain, and that individual difference variables also impact on this relationship.

1.3 CONTROL.

Control is widely believed to be desirable and associated with positive outcomes, early theorists regarded control as an intrinsic human need (e.g. Adler, 1930; White, 1959) or central motivating factor (e.g. Woodworth, 1958).

A meta analysis related perceived control to 19 employee outcome variables. The analysis cumulated mean correlations weighted by sample size across 101 samples derived from 88 studies. Results indicated perceived control was consistently associated with high job satisfaction, commitment, involvement, performance and motivation; and low levels of physical symptoms, emotional distress, role stress, absenteeism, turnover intention, and turnover. No relationship was found between participative decision making and absenteeism in the single study examined. Perceived control may be an underlying factor in both autonomy and work participation as result patterns were similar for both variables (Spector, 1986).

Organisational intervention projects designed to increase employee participation (Jackson, 1983), group autonomy and group work identity (Wall & Clegg, 1981) have found reduced levels of psychological strain.

Personality factors have been shown to moderate the personal control-job stress relationship. An experimental study found job control was negatively related to anxiety and pulse rate, the effect was stronger for

subjects with external locus of control. This research suggests that job control is most beneficial for individuals with high activity level and/or external locus of control (Perrewe, 1987).

An examination of the relationship between work environment variables, type A, and CHD in a sample of salaried male white collar workers, found that apart from physical comfort, work environment variables were not related to CHD (Chesney, Sevelius, Black, Ward, Swan & Rosenman, 1981). High autonomy was linked with low blood pressure for type A's, and high blood pressure for type B's. A person-environment fit approach to risk reduction for CHD was recommended. However, the level of demand was not assessed, and the homogenous sample of salaried workers would all be expected to have a relatively high degree of autonomy. This sample of personality research suggests control is associated with reduced strain, particularly for the type A behaviour pattern.

Experimental laboratory research has demonstrated that under aversive conditions, strain is reduced when a control response is available. The perception of control has been sufficient to show a moderating effect on strain. Stressors examined have included noise (Glass & Singer, 1972), cold pressors, intelligence tests and unpleasant photographs (Ganster & Fusilier, 1989).

Glass Reim and Singer (1971) found that adaptation to uncontrollable noise led to an increase in tension (measured by tonic skin conductance) and impaired performance after exposure to the noise. In comparison with other no-control groups, subjects in a relative deprivation condition reported the least control, and performed significantly worse on a proof reading task.

With regard to aversive stimuli, Thompson (1981) identified four types of control: behavioural, cognitive, informational, and retrospective. Evidence suggested that behavioural control reduced anxiety, and physiological arousal when anticipating an aversive event. Individuals with

control tolerate more, and may have improved task performance during an event, which flows over into the postevent period. The level of pain or stress experienced by a noxious event does not appear to be affected by control level. Cognitive control was associated with reduced anxiety before, during and after an aversive event, although particular strategies varied in their effects. Informational control was associated with mixed effects. It appeared the meaning assigned to an event was more important in determining reactions than retrospective control per se.

A typology of control more relevant to occupational stress research was offered by Ganster (1988). The multidimensional construct included control over the tasks, pacing, and scheduling of work, the physical environment, influence in policies, goals and procedures of the organization, control over the activities of others, and job mobility. The ability to distinguish between control dimensions is advantageous as a worker's level of control can be expected to vary over the dimensions.

A range of theories have been offered to explain why control reduces the strain associated with an aversive event. These can be placed in three broad categories, a) control as predictability, b) impact on self image, and c) future outcomes. Research has found the effects of control cannot be accounted for by predictability alone (Ganster & Fusilier, 1989). While theories related to self -image have some explanatory value, the more pertinent theory relates control to experienced outcomes (Thompson, 1981).

MECHANISMS OF CONTROL EFFECTS

Control may effect health (or strain) through several potential mechanisms (Frese, 1985). First, control may be used to directly reduce or eliminate a stressor. Second, the stressor remains unaltered but control reduces the impact of stressors on ill health, this may occur through: a) fitting the stressful situation to the psychological and physiological state of

an individual. A typical situation may be through control over timing, and sequence of tasks and plans. b) The minimax hypothesis states the knowledge one can prevent, or terminate a stressful event before it becomes intolerable, may enable maximum danger to be avoided (Miller, 1979). c) An individual with high control is expected to be more persistent in efforts to cope with perceived stress. This has the potential for control to be associated with negative consequences. The final mechanism was the intrinsic need for control. This suggests a direct perceptual effect of job control on strain. Frese (1989) found some evidence that the minimax hypothesis influenced the relationship between objective and perceived stressors, whereas the fitting process moderated the interaction between stressors and psychosomatic complaints. Other potential pathways were either too difficult to test, or were not supported by the study.

1.4 PSYCHOSOCIAL EFFECTS OF THE WORK ENVIRONMENT

Two separate branches of research have focused on the psychosocial effects of the work environment (Karasek, 1979). The literature on job satisfaction and mental strain focused on control, whereas the life stress tradition emphasised environmental stressors (demands) and resultant illness. Karasek (1979) believed the respective neglect of demand or control in both research traditions explained results that otherwise seemed paradoxical. These issues are outlined as follows: first, both executives and assembly line workers had stressful jobs, but differences in job satisfaction could not be explained without consideration of control. Second, all job characteristics tended to be considered demanding regardless of varied effects on psychological functioning. This created an erroneous impression that

strain increases with all types of demand. Third, the relationship between job conditions and mental strain or dissatisfaction was not observed in several studies. Finally, the concept of overload (or underload) included environmental and individual variables in the one concept. Overload is said to occur when environmental demands exceed an individual's ability to meet them.

A complete examination of environmental variables (e.g. control) before consideration of individual factors has more potential to advance understanding of occupational stress. A clear differentiation between the two factors would avoid an overemphasis on individual characteristics, and assist in the development of clear initiatives for organisational policy and job design. The Job Demand-Control Model offers a more complete explanation of job strain, as it considered both job demands and the extent of control the worker has to meet the demand.

1.5 THE JOB-DEMANDS CONTROL MODEL OF OCCUPATIONAL STRESS

The Job Demands-Control Model (JD-C) of occupational stress (Karasek, 1979) postulates that control moderates the stress-inducing effects of job demands. The focus is on the influence of the workplace in the development of stress rather than on individual coping mechanisms. An implication for job redesign is "that it may be possible to improve job-related mental health without sacrificing productivity" (Karasek, 1979, p. 303). An increase in decision latitude (control) may relieve job strain independent of changes in workload demands. However, the main emphasis of research on the JD-C model has been to examine the effect of the work environment on health. This has arisen from a growing recognition of the influence of

psychosocial factors in occupational health and safety (Sauter & Hurrell, 1989).

The Job Demands-Control Model holds that psychological strain results from the joint effects of job demands and the extent of decision making freedom (control) available to the worker. To the extent that the worker is allowed job control, he/she is able to select actions to cope with job demands. Karasek (1979), defined job decision latitude as "the working individual's potential control over his tasks and conduct during the working day" (p. 289-290).

The construct of job decision latitude (or control) has two factors, skill discretion and decision authority. Skill discretion refers to the "breadth of skills usable on the job" (Karasek & Theorell, 1990, p. 58). A high level of skill is believed to give the worker control over which specific skills to use to accomplish the task. Decision authority, similar to task autonomy, is referred to as "social authority over making decisions" (Karasek & Theorell, 1990, p. 58).

Figure 1 describes the relationship between job demands and job decision latitude. Two predictions are made by the JD-C model. Along diagonal A, mental and physical strain increase as job demands increase relative to decreasing decision latitude. Along diagonal B, job demands and decision latitude are matched. Where job demands and latitude are low, the job is described as `passive'. Over time, adaptation to low decision latitude, low demand jobs leads to a reduction in the ability to solve problems, make judgements and "tackle" challenges, similar to `learned helplessness' (Maier & Seligman, 1976, in Landsbergis, 1988). As the job demand/ decision latitude match increases, more active learning and a greater internal locus of control enable individuals to develop a broader range of coping strategies. When job decision latitude, and job demands are high, the job is described as

`Active'. An active job is expected to result in the development of new behaviour patterns both on and off the job due to the effect of socialisation.

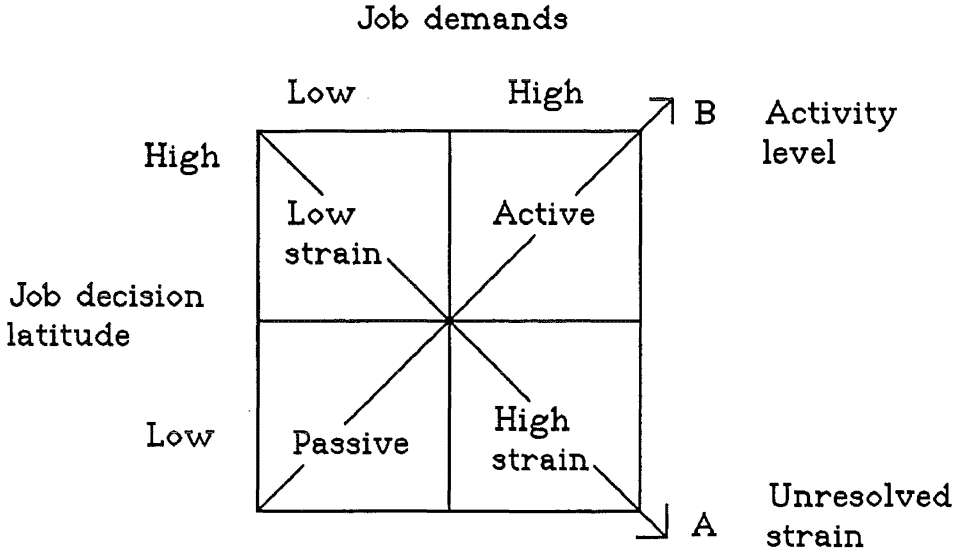
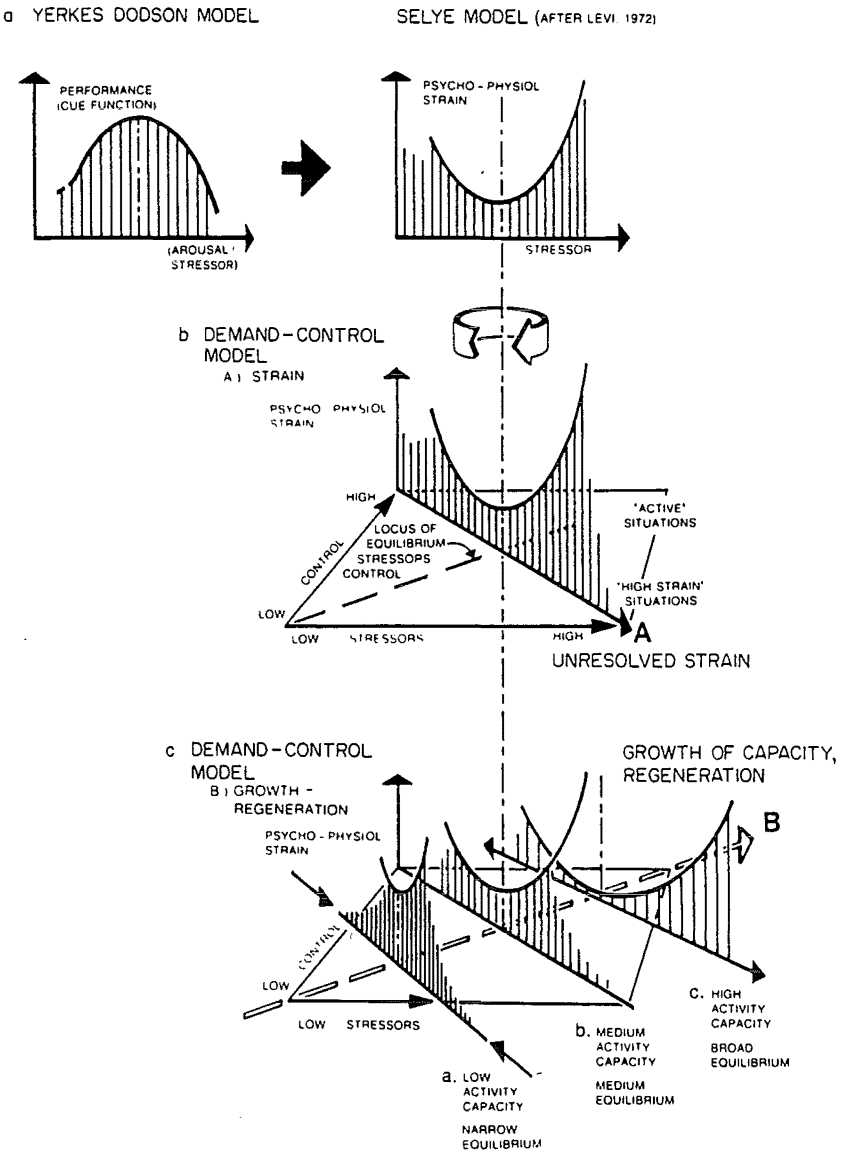


Figure 1.1. Job Demands - Control Model.

Job decision latitude and job demands may be considered separately as they correlate only slightly. The United States Quality of Employment Surveys recorded a correlation of 0.17, and the Swedish Level of living Surveys found correlations of 0.05 to 0.26 (Karasek, 1981).

The job strain model has some explanatory value in relation to the General Adaptation Syndrome of Selye (1936) (Karasek, Russell, & Theorell, 1982). The "U" shaped relationship between stressors and response did not specify the conditions under which stress changes from having positive to adverse consequences. The job strain model predicts that level of control over a stressor determines whether the outcome is positive or negative. Selye's model can be translated onto the dimension of unresolved strain (diagonal A) in Karasek's model (see Figure 1.2a). Strain is lowest when the level of demand and control are matched or in equilibrium, and strain

increases at points of disequilibrium. Optimal performance occurs at the lowest part of Selye's "U".



Redrawn from Karasek, Russell, and Theorell 1982.

Figure 1.2 (a-b). Comparison between job demand/control model and other stress models.

The job strain model is able to be more specific: optimal performance occurs when levels of demand and control are balanced. In addition, peak performance levels increase with increases in the level of stressor/control

equilibrium (see Figure 1.2b). That is, as jobs move from being passive to more active along diagonal B. Higher levels of demand/control match are associated with a wider range of optimal activity (or ability to face greater challenges). Conversely, a very narrow curve of optimal performance is the result of extreme low levels of control and demand match. Over time, a worker in a very passive job would perceive even a small increase in demand as strain inducing. This is equivalent to the process of "learned helplessness."

Along the dimension of active growth, increased demand is met with challenge only up to a point. At very high work loads an equivalent level of control would no longer be able to offset the negative impact of strain. Intellectual complexity can function as a stressor in certain jobs, although Karasek (1989) believes this has only been a problem in high status jobs.

More recently, the JD-C model has been expanded to include social support in the workplace (Karasek & Theorell, 1990). The model is concerned with the close personal relationships with co-workers and supervisors. American evidence suggests that social support is an important correlate of job satisfaction and low psychological strain (e.g., Quinn & Stains). Analyses from the U.S. Quality of Employment Survey (1972, 1977) linked social support with lower depression. A job strain association (demand/control) was found for each level of social support. The addition of social support increased the explained variance for depression symptoms from 6% to 41%.

The combination of high social support and high control (termed participatory leader) identified professional occupations such as scientist, teacher, and farmer. Low social support/high control (cowboy hero) included lawyers, artists, and architects. Low social support and low control jobs (isolated prisoner) include machine-paced assembly workers. This was considered a clear sociobiological misfit with human physiological

capabilities. The high social support/low control occupations (obedient comrade) include delivery personnel, and stock clerks.

Empirical evidence for the extended model is only beginning to emerge. However, social support is potentially an important dimension for understanding occupational strain.

By extending the model in the micro direction (person based) and towards the macro level (social) the authors hope the model will provide a basis for communication and integration between disciplines of scientist and practitioner. The basic task level model fits between two divergent approaches. On the micro level, the relative contribution of personality and environmental factors may be assessed. The task model may also provide an integration point for group and organizational dynamics, such as job design, organizational policy and societal implications (Karasek, 1989).

1.6 LINK WITH PHYSIOLOGICAL RESPONSE

A comprehensive discussion of the link between the JD-C model and physiological response is provided in Karasek and Theorell (1990). Briefly, the physiological responses of catabolic (metabolic consumption) and anabolic (restoration) are hypothesised to link the respective mechanisms of strain and learning in the JD-C model (Karasek, Russell, & Theorell, 1982; Karasek & Theorell, 1990). Catabolic responses are expected to occur more frequently in high demand/low control (high strain) work. Catabolic processes include the catecholamines (noradrenaline and adrenaline), and cortisol. Adrenaline secretion occurs soon after exposure to a stressor. Chronic excess production of catecholamines is associated with ongoing exposure to a stressor. Cortisol is associated with feelings of distress and depression. The health-promoting phenomenon of anabolic processing is

associated with active jobs (high control/high demand). Physical regeneration processes are not well understood, so predictions are rather speculative at this stage.

Psychosocial factors are considered a contributing cause of myocardial infarction. "Psychosocial factors at work play some role in three different pathways to heart disease: 1) They may contribute to several long-term physiological processes such as hypertension and atherosclerosis [narrowing of the coronary arteries]. 2) They may be involved in the acute triggering mechanism for coronary heart disease. 3) Finally, they may aggravate the effects of conventional risk factors" (Karasek & Theorell, 1990, p. 111).

1.7 INDIVIDUAL DIFFERENCES AND THE J D-C MODEL

The JD-C model was designed to "delineate the environmental contribution to stressful individual states and perceptions of control" (Karasek, Russell & Theorell, 1982, p. 35). However, the model can also provide an interface between the level of the task and the individual. Attention to individual effects offers refinements to the model and contributes to the development of a more comprehensive theory of individual-environment interaction (Karasek, Russell & Theorell, 1982). A small proportion of research on the JD-C model would fit into this category.

Kushnir & Melamed (1991) found `high strain' jobs were more stressful for Type A's. Workload and perceived control had significant effects on all dependent variables (including satisfaction and anxiety) but no interaction effects were found. Low control and high demand jobs were more stressful for subjects with Type A behaviour.

1.8 GENERAL RESEARCH ON THE J D-C MODEL.

The Karasek group have conducted a broad range of studies to test the job strain model. Although a range of study methods and job dimensions were used, studies were generally supportive of the J D-C model. Increased control was associated with less strain, and demand was positively related to strain on outcomes of job satisfaction, CHD, absenteeism, and psychological strain.

In order to obtain samples large enough to test for CHD effects, secondary analyses of national survey data in Sweden (Swedish national level of living surveys) and the USA (Quality of Employment survey Quinn, Magione & Seashore, 1975) were frequently used. Scale items measuring job decision latitude differed between surveys. The U.S. scale items were:

1. Freedom of how to work.
2. Allows a lot of decisions
3. Assists in one's own decisions.
4. Have a say over what happens.
5. High skill level required.
6. Required to learn new things.
7. Non-repetitious work.
8. Creativity required.

Items in the Swedish measure of control were:

1. Skill level (years of training/education required).
2. Repetitious or monotonous work.
3. Expert rating of skill level required.

Initial work found occupations characterised by high demand and low decision latitude associated with mental strain and job dissatisfaction

(Karasek, 1979). The predicted interaction was found for exhaustion, job dissatisfaction, and life dissatisfaction in the U.S. data, and depression in the Swedish data. However, the methodology of the interaction has been questioned (Ganster, 1989; Spector, 1987) as a subtraction term of demand and control was selected in favour of the recommended product term procedure (Cohen, 1978).

A complementary analysis representative of the working population of Finland (Kauppinen - Toropainen, Kandolin & Mutanen, 1983) found the job strain model predicted job satisfaction and work-related emotional strain. However assumptions of the model along the `active' `passive' dimension were not supported. Job satisfaction increased more in active (high demand/ high control) jobs than low demand/ high control jobs (`low strain'). For women, high levels of job dissatisfaction and emotional strain were associated with `passive' jobs.

Research attention then concentrated on examining the hypothesised link between work strain and disease. A prospective study (1968 - 1974) found low decision latitude was associated with increased risk of cardiovascular disease. High demand was linked with a greater risk of developing CHD symptoms and premature cardiovascular-cerebrovascular death. The 1974 cross-sectional study revealed 20% of males in the high strain (low control/high demand) group reported CHD symptom. Longitudinal results revealed 5 to 9 percent of males in the high strain group developed CHD symptoms. While the results are suggestive of an interaction effect, no relevant statistical tests were conducted. The decision latitude scale included a personal schedule freedom index (e.g. private phone call, visitor), but no effects were found (Karasek, Baker, Marxer, Ahlbom & Theorell, 1981).

Hospitalization and case-control studies found a greater risk of myocardial infarction in demanding occupations with few possibilities of

control or growth. Associations remained after controlling for smoking, education, ethnicity, and heavy lifting (Alfredsson, Karasek, & Theorell, 1982; Alfredsson & Theorell, 1983). A one year follow-up study found men hospitalised for myocardial infarction were more likely to work in occupations with frequently reported `hectic' work and `few possibilities to learn new things'. Women were more at risk when employed in `hectic and monotonous' occupations. The relative hospitalization ratio indicated that both men and women exposed to the respective job factors were 1.6 times more likely to be hospitalised for myocardial infarction. Associations remained after controlling for 12 possible confounding factors (Alfredsson, Spetz & Theorell, 1985).

The opportunity-to-learn item was considered a similar, but distinct construct from control that does not fit well with the job strain model (Kasl, 1989). Physical demands combined with hectic work were often associated with higher risk. This unexpected result may indicate a bias in case control studies where ratings of physical demands are affected by pre-existing illness (Kasl, 1989).

Subjects were assigned to quadrants by matching census occupation codes to an existing occupational classification system derived from a Swedish national sample. The assignment method was essentially an occupational level of analysis. Data interpretation at the occupational level was difficult due to variability and potential confounding factors (Ganster, 1989).

A similar assignment procedure was utilised in an 18-year follow-up study of men of Japanese ancestry living in Hawaii. No evidence for the link between `high strain' occupations and coronary heart disease was found. A weighted factor for length of time in the job also showed no effects (Reed, LaCroix, Karasek, Miller & MacLean, 1989). The age of the cohort (45-68 years at entry) may have been a factor as studies have found stronger associations

between job strain and CHD in younger people (under 55 years). The study by Reed et al. (1989) only included people working in their usual occupation, whereas other studies frequently classified subjects by current occupation. This confounds strain effects associated with the present job with factors associated with job mobility. A further explanation may be that the proportion of high-strain jobs was smaller in Hawaii than in the mainland U.S., since industrialisation only came to the island of Oahu relatively recently (Karasek, 1989).

Interpretation of results was hampered by the use of indirect job-strain scores, as it was not clear whether this reflected the subjects' actual experience (or perception) of job strain. Classification error may have arisen from differences in perceptions and job conditions of the cohort, and the sample of U.S. men from which the job classification system was developed. An indication of this was found in the study, as result patterns differed between traditional and more westernised Japanese men. Reed et al. (1989) recommended that future studies use direct measures of perceived job conditions.

Fewer studies examined the JD-C model in relation to Coronary Heart Disease in women. The lower incidence of CHD in women combined with the need for a very large sample was the most likely reason. The association between job control and CHD appears more complicated in women possibly due to additional household and childcare work. Women are also concentrated in different occupations to men (Karasek & Theorell, 1990).

The relative importance of stress effects and moderators for work and home life were examined in a survey of Sweden's Federation of White Collar Unions (TCO) (representing 25% of the labour Force). The decision latitude scale was similar to that used by Karasek (1979). After age, job factors were found to be the most important predictors of health and behaviour,

increasing explained variance by 60%. The strongest job factors being control and workload (Karasek, Gardell & Lindell, 1987).

Company-induced reorganisations were also examined from the 1976 TCO survey data. Fewer illness symptoms were associated with worker influence in the reorganization process, and subsequent increased task control. Higher job control resulted in reduced risk of coronary heart disease, absenteeism and depression for males, associations were weaker for women. The findings suggested that participation in the change process may overcome the strain directly associated with the restructuring. The loss of control either in the restructuring process, or subsequent job was associated with increased strain effects. The retrospective survey fulfilled criteria for rigorous field study (Karasek, 1990).

A survey of health service workers was supportive of the model as high demand/low control jobs were associated with the most dissatisfaction and psychological strain. The job decision latitude scale was similar to the U.S. items in Karasek (1979). High intercorrelations indicated the sample did not clearly discriminate between variables. The use of more objective measures was recommended (Landsbergis, 1988).

Other field surveys at the job level have not found interaction effects. Payne and Fletcher (1983) surveyed 148 schoolteachers. Two analyses were conducted on the data, one replicated Karasek's (1979) subtraction method, but no significant results were found. Spector (1987) sampled 136 female university clerical workers in a range of settings. Control and demand correlated with satisfaction and health outcomes, but no interaction effects were found. Both studies were cross sectional with entirely self-reported measures.

While evidence for the job-strain model has been reasonably consistent, research limitations prevent a strong interpretation of findings. The research has been criticised primarily on methodological grounds.

Secondary analyses of data necessitated the use of a restricted measure of decision latitude, particularly in the Swedish scale. The operationalization of control incorporated a related construct of skill variety, or job complexity (Ganster, 1988, 1989). It was not possible to isolate the specific effects of job control from other factors, although the related measures were able to show broad approximations.

The occupational level of analysis was described as a very "crude" measure as it overlooked considerable variability in job characteristics within occupations. Ganster and Fusilier (1989) found as much variability in perceived job demands for a sample of nurses in several employment settings, as for workers over 23 occupations from factory employees to professors. Kasl (1989) pointed out the extreme difficulty of relating item-score variance to specific aspects of the work situation, for example, the nature of hectic work may be very different on an assembly line than for a teacher, architect, or surgeon. However, results at the occupational level were consistent with individual level research (e.g Karasek, Gardell, & Lindell, 1987), although associations were weaker for the latter (Ganster, 1989). The assignment of job characteristics by occupational title was also an imprecise measure of job conditions. This method created additional difficulties when perceived levels of occupational strain in one sample were applied to quite different populations and situations (Reed et al, 1989). The validity of the job strain measure would be improved by a direct assessment of job conditions actually experienced by the cohort.

A proportion of survey studies utilised self-report measures for both independent and dependent variables, and thereby risk contamination from common method variance and response consistency effects (e.g. Landsbergis, 1989).

Most studies focused on perceived job characteristics, although assessments were often indirect. Several studies have mentioned the need

for more objective measurement of variables and recent work has moved in this direction.

Dwyer and Ganster (1991) sought a more objective measure of job demand than typically used. A sample of 90 male manufacturing workers employed in one plant completed the survey. Job demand was assessed from job analysis in addition to self report. The control scale covered task variety, order of task performance, pacing, scheduling of rest breaks, procedures and policies in the workplace, and arrangement of the physical environment. Results were supportive of the job strain model. Tardiness and sick days reached high levels only for jobs with high objective demand and low control. Results differed for perceived demand in that `high strain' jobs had less satisfaction and increased voluntary absence, but had no effect on tardiness or sick days. The differential effect for demand was regarded as highlighting the need for a more objective operationalization of job demand than was usually achieved by self reported measures.

A laboratory test of the JD-C model under conditions of work overload found partial support, in that high perceived control moderated the effect of perceived demand on anxiety (Perrewe & Ganster, 1989). Objective manipulations had no effect on any of the outcome measures of anxiety, job satisfaction, and physiological arousal. The results were described as conservative due to constraints the laboratory environment, of short task duration, and reduced psychological impact associated with research.

The JD-C model may offer some explanation for stress related problems experienced by Visual Display Terminal (VDT) operators. Lack of control may arise from task changes associated with consideration of technical factors at the expense of operator concerns. This situation may arise from changes in task structure and redivision of labour between the person and machine that occurs when computer application systems are installed

(Turner & Karasek, 1984). Visual Display Terminal positions with low levels of task control have been associated with increased psychological strain. Smith, Cohen and Stammerjohn (1981) found clerical VDT operators reported more job stress and health complaints than equivalent clerical jobs (non-VDT) and professional VDT operators. Clerical VDT jobs were characterised by low control over work activity, work pace, and operators were `tied to work stations'. Operators were also subject to computer system monitoring, with reports on production rate and error level available to supervisors.

1.9 CONCLUSION

Research has provided reasonably consistent evidence in support of the job strain model. The lack of job control combined with high demand was associated with increased strain on a range of factors including coronary heart disease, job satisfaction, absenteeism, depression and anxiety. Associations tended to be stronger in cross-sectional studies than longitudinal analyses. Laboratory research found weaker support for the model, although the results were expected to be conservative. Some of the limitations of the large CHD studies have been avoided in more recent research. Studies at the job level with more stringent methods have found at least partial support for the model.

The research did not provide very convincing evidence of interaction effects. Studies did not always test for an interaction, and results were more suggestive of an additive relationship between demand and control. However, Karasek (1989) commented that Coronary Heart Disease interactions were extremely difficult to detect with ordinary-least-squares regression analysis, as the obtained effect size is limited by the frequency of

the problem in the population. Prevalence rates are very small for coronary heart disease, and are reported to be under 20% for job dissatisfaction and serious depression (Karasek, Gardell & Lindell, 1987). While evidence of a multiplicative interaction effect would be desirable, it was not considered essential for the validity of the model. The important prediction for the model was that the separate effects of demand and control combine to predict strain and also active coping through motivation and learning.

Evidence for the JD-C model is encouraging, although results are far from definitive. Kasl (1989) concluded that "... fundamental questions regarding conceptualization, measurement and supporting evidence remain unanswered..." (p. 177). It would be premature to judge the efficacy of the JD-C model solely on the basis of existing research. Through job redesign, the JD-C model has important implications for strain reduction and improved health.

1.10 RATIONALE

Research examination of the job strain model has been constrained by (a) the need for more precise measurement of the construct of control, and (b) a greater emphasis on the objective measurement of variables. Differential strain effects have been found for objective and perceived measures of control and demand (Perrewe & Ganster, 1989; Dwyer & Ganster, 1991). In the stress literature, both objective and perceived measures are purported to have theoretical value. This suggests that the relationship between objective and perceived variables, and their separate effects, should be clearly specified.

Laboratory studies have demonstrated a fairly consistent relationship between a lack of control under aversive conditions and resultant strain effects (Ganster, 1988). While a range of stressors have been tested, the effect

of control on job strain is only beginning to be addressed (Perrewe & Ganster, 1989).

Perrewe and Ganster (1989) examined the impact of behavioural control on experienced strain under conditions of work overload. No effects were found for objective control. Perceived control had no effect on job satisfaction or physiological arousal. Partial support for the model was reported as perceived high control reduced the impact of perceived demand on anxiety. However the effect was weak, as the interaction was only marginal ($P < 0.1$). In explanation of the result, the authors suggested that control may need to be meaningful to an individual before it has a moderating effect with demand on satisfaction.

The present study was designed as a test of the Job Demands-Control Model. A laboratory experiment was chosen as it enabled a relatively precise operationalization of job decision latitude, and an objective manipulation of job demand and control. It also permitted examination of perceptual variables and a comparison of results with objective analyses.

Since the laboratory was regarded as providing a conservative test of occupational stress, a relatively strong manipulation of control was sought to provide an adequate test of the model. The present study also aimed to extend the work of Perrewe and Ganster (1989) by employing a broader operationalization of control. Skill discretion was examined in addition to behavioural control (decision authority), providing an assessment of both aspects of job decision latitude. The multidimensional operationalization of control incorporated several dimensions of behavioural control specified by Ganster (1988). However, a combined assessment precluded examination of the separate effects of each control dimension.

Perrewe and Ganster (1989) suggested that meaningfulness may be a prerequisite for control to have an effect on strain, therefore, an attempt was made to produce a task perceived to be meaningful. The task was designed to

be creative, provide some intrinsic reward, and be of some practical value. In order to achieve this a craft making task was selected where items were completed, then offered to children's charities. This contrasts with Perrewe and Ganster's (1989) study as their mail sorting task involved little creativity and did not appear to have any direct productive value. The task cycle time in the present study was several minutes, rather than the few seconds required to sort an item of mail.

In order to facilitate comparisons between studies, the outcome measures were similar to those examined by Perrewe and Ganster (1989), and are common in occupational stress research. Strain effects examined in the present study were anxiety, task satisfaction, and pulse rate.

1.11 HYPOTHESES

The present study was designed as a laboratory test of the Job Demands - Control Model of occupational stress (Karasek, 1979). The model postulates that control functions as a moderator of the strain-inducing effects of job demands. The following hypotheses are in accordance with the predictions of the model:

Hypothesis 1.

High task demand will result in more strain as indicated by low job satisfaction, high anxiety and high physiological arousal.

Hypothesis 2.

High control will lead to reduced strain as indicated by high job satisfaction, low anxiety, and low physiological arousal.

Hypothesis 3.

An interaction between job demands and control is predicted such that the effects of demands on experienced strain will be less under conditions of high control. The predicted interaction is illustrated in Figure 1.3.

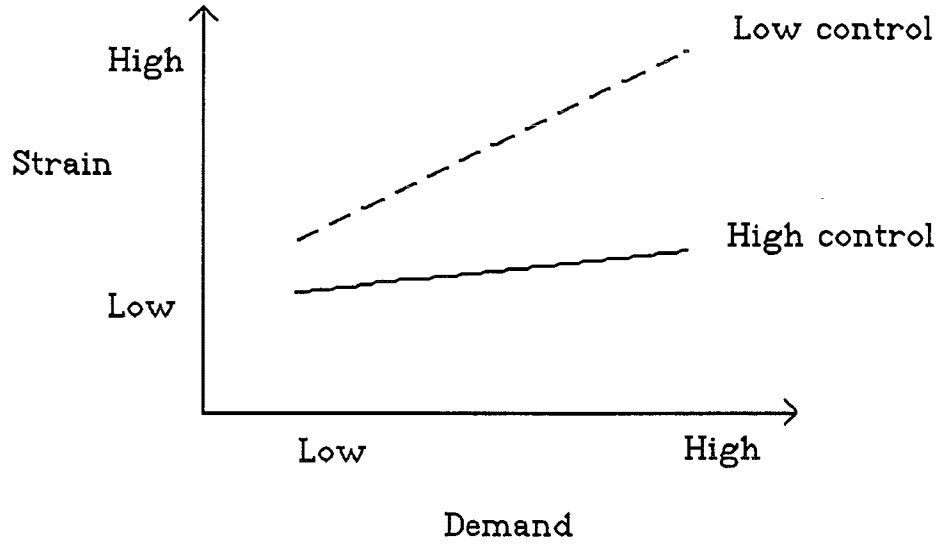


Figure 1.3. Predicted effect of job demand and control on experienced strain.

Hypothesis 4.

High demand-high control (`active') workers, and low demand-low control (`passive') workers will register intermediate and approximately equal levels of strain, i.e., higher than low demand-high control (`low strain') workers and lower than high demand-low control (`high strain') workers.

CHAPTER TWO

METHOD

2.1 DESCRIPTION OF TASK

Although not a direct simulation of stressful work, characteristics of actual jobs were incorporated into the task where feasible. The experimental task involved the construction and decoration of paper kites. Task instructions and samples for making several kites were provided.

Kite making may be described as a creative assembly task. The task was designed to include elements of work that have been considered stressful. The task was similar to various outwork-jobs that involve the making of handcrafts. Elements of sewing machinist work were incorporated in the task in the sense that a complete item was made, the work was repetitive with a cycle time of several minutes, and involved elements of piece-work in the low control condition.

2.2 PILOT TESTS

Two sets of pilot tests were conducted to ensure that the independent variables were manipulated effectively and that the measures were suitable for the purposes of the study. These tests indicated that the satisfaction and axiety measures discriminated between groups, and that a 7-point scale was suitable for application to Stone's Semantic Differential. All demand and control items discriminated between experimental conditions with one

exception. The original supervision item "the supervisor left me on my own" was shown to be ambiguous, so was replaced with an item written specifically for the study.

Pilot testing indicated the control manipulation was effective, since high and low levels of control were perceived as appropriate. In response to a subject,s suggestion, high control subjects were able to create their own kite designs, and this increased subjective ratings of control.

The demand requirements were established through pilot testing. The high-demand requirement was intended to be almost achievable. As several subjects were able to make 6 kites, the number required was set at 7. The low-demand level was designed so that the task required the full time without subjects feeling time pressured. Although the level of reported demand was slightly high (58%) when subjects were required to make 3 kites, it was clear that if only 2 kites were required, the task would often be completed in well under 30 minutes. In an effort to slightly reduce the level of demand, the instruction was modified so subjects were asked to `aim' to make 3 kites.

Subject responses and comments indicated the demand and control manipulations were generally perceived as intended.

2.3 SUBJECTS

The sample consisted of 112 volunteer undergraduate (stage 1 and 2) psychology students recruited during regular lecture and laboratory times. Participants were aged between 18 and 49 years (mean age: 21). The median and mode age for both males and females was 19 years. The 76 female and 36 male subjects were spread proportionately among the four experimental conditions.

2.4 APPARATUS

Equipment required for the task was: A4 paper (four colours), crepe paper (four colours), felt pens (five colours), cotton, needles, needle threaders, glue, and a plastic supermarket bag (for rubbish bin).

Pulse rate was measured with a Polar Vantage XL^{TM} (Transmitter) heart rate monitor. All timing during the experiment was conducted using a Casio digital wrist watch. Pulse rate was averaged over 5-second intervals and displayed as heart beats per minute.

2.5 DESIGN

The effects of quantitative task demand and behavioral control on task satisfaction, anxiety and physiological arousal were examined in a 2 x 2 experimental design.

Paper kite making was developed as a creative assembly task incorporating elements of work that have been considered stressful. The task was similar to a range of craft work (e.g. sewing machinist) in the sense that a complete item was made, the work was repetitive with a cycle time of a few minutes, and it involved piece work in the low-control condition. As the task involved making an object, the work offered some practical value in addition to research purposes.

Steps involved in making kites were to fold paper and cut to shape, attach tails by string or glue, and tie a kite string (bridel). Decorations drawn with felt pens, and/or glued paper shapes were required on all kites. Instructions included a quality standard where kites were to be folded evenly, kite string and tails attached in correct place, kite string slightly

longer than the top of the kite, kite decorated (and in low-control conditions: kite was required to be a close copy of the sample kite).

High task demand was operationalised by asking subjects to make 7 kites in 30 minutes (1 kite every 4 minutes). Moderate task demand was operationalised by asking subjects to aim to make 3 kites in 30 minutes, but 'not to worry' if they do not get all 3 made.

Efforts were made to standardise variations in task demand associated with differences in kite design and decoration. A minimum of two types of kite were required in the low-demand condition, and four in the high-demand condition. Low-control subjects were required to copy the kites produced by their high control partners, with whom they were matched for gender and level of demand.

The control manipulation covered a range of factors, which are described in Table 2.1.

2.6 PROCEDURE

Subjects were randomly assigned to experimental conditions. It was necessary to run the experiment for the high-control condition initially, so kite samples would be available for the low-control condition. While an equal number of male and female subjects were sought, fewer male volunteers led to gender being balanced proportionately among the four experimental conditions.

A maximum of 6 subjects were tested at one time. As subjects arrived, they were asked to wear a heart rate monitor which they fitted themselves. Subjects were seated individually at separate points in the room where they could not see each other's work.

Table 2.1 OUTLINE OF HIGH AND LOW CONTROL CONDITIONS

	HIGH CONTROL CONDITION	LOW CONTROL CONDITION
METHOD OF WORK	Free choice.	Must follow a set work method, and order of work.
KITE DESIGN	Wide choice. Kites could be selected from the 5 designs on the guide sheet, a variation of these, or completely their own design.	Required to copy the kite designs of their high-control partners, from sample kites.
DECORATION	Free choice.	Copy decoration of high-control partner.
MATERIALS	May use any combination of glue, needle, cotton and scissors to attach kite string and tail.	Must replicate materials selected by high-control partner.
COLOUR CHOICE	Choice of 4 coloured papers (A4), 4 crepe papers, and felt pens (5 colours) for making kites.	Coloured supplies provided as per the high control condition, but no choice was possible, as low-control subjects were required to copy the colours selected by high-control partners.
FEEDBACK SHEET	Provided to enable each subject to keep a tally of his/her progress toward the goal.	Subjects were instructed the feedback sheet was to be completed so the experimenter could ensure the required pace was being maintained.
REST BREAK	Allowed to take a 1-minute rest break at any time during the work period.	Rest break corresponding to choice of high-control partner (no high-control subject actually chose to take the rest break).
SUPERVISION	Strictly limited to assistance *only* in response to a subject's request.	Subjects were given a supervision check every 5 minutes after the pulse rate was taken. Supervision involved reinforcement of instructions; and provision of assistance; comment on progress and time remaining.
RUBBISH BIN	Subjects were informed the bin was there if they wished to use it.	Subjects were instructed to keep their work area tidy and place scraps in the bin provided.

Desks were equipped with items necessary for kite making prior to subjects arriving. Pairs of sample kites were laid out in a specified order of work for the low control condition. Every subject was supplied with a written instruction sheet, a feedback sheet, diagram instructions for five kite designs (see Appendix A), and the Trait scale of the State-Trait Anxiety Inventory (STAI).

Once seated, subjects were asked to complete the STAI anxiety scale `for how you feel right now.' Subjects were then verbally instructed in the task and guided through written instructions appropriate to the experimental condition.

For participation in the experiment, subjects were reminded they would receive chocolate fish and entry into the raffle. Kites could be returned to subjects or be offered to children's charities.

Subjects were informed that the kite-making task had similar characteristics to tasks performed in several in industrial organisations.

High-control subjects were able to select kite designs from the 'design' sheet, make a variation of these, or design their own. Low-control subjects were told to make the kites in order from the nearest pair of sample kites to the farthest. The following procedure was then read to subjects who were told it was important to complete each of the steps for two kites at a time:

1. Make the kite shapes (i.e. fold and cut).
2. Attach kite string (string must reach above top of kite).
3. Attach kite tails.

4. Decorate by copying the design on the sample kite exactly.

Repeat steps 1-5, making two kites at a time. The 7th [low demand: 3rd] kite is made as a single unit.

Subjects were informed that the aim was to copy the sample kites exactly, including colours, shape and decoration of the sample kite. If variations occurred between the sample kite and the `design' sheet, the sample kite took precedence.

All subjects were told kites must have a tail, a kite string, and be decorated. The kite design sheet was then explained, subjects were shown the fold and cut lines, shapes that were rectangular or square, and construction of the 'Junebug'. Subjects were also shown how to use the needle threader. Questions were answered, High-control subjects were invited to ask questions at any time if assistance was required.

High-control subjects were informed that the feedback sheet was there to help them manage their time, whereas low-control subjects were told the feedback sheet was to be completed for the experimenter to ensure that the required pace was being maintained. High-control subjects could take a one-minute rest break at any time during the work period, recording the time on the feedback sheet. Subjects in the low control condition would be restricted to the choice of their high-control partner.

High-control subjects were shown the location of the rubbish bin. Low-control subjects were also instructed their work area must be kept tidy, with all scrap paper and thread placed in the bin provided.

All subjects were told their pulse rate would be recorded at 5-minute intervals over the 30-minute task period. Questions were answered. The pulse rate of each subject was then recorded over a 30-second period (after being seated for about 5-minutes). Subjects were then told to start work on the kite making task. After the final pulse rate was taken, subjects were told

to stop work. They were then given the second questionnaire which contained the anxiety scale (completed first), manipulation checks for control and demand, and satisfaction measures. Subjects were instructed to complete the anxiety questionnaire for 'how you feel right now'. Once the task was completed, subjects were thanked for participating in the study, asked to remove the pulse rate monitor, offered chocolate fish and then debriefed.

2.7 MEASURES

Questionnaire measures are presented in Appendix B.

A. STATE - TRAIT ANXIETY INVENTORY (STAI)

The 20-item, 4-point, STAI State scale (Speilberger, Gorsuch & Lushene, 1970) was administered as a pre-test and post-test measure. Subjects were asked to report 'how they felt *at this moment.* ' The concept of state anxiety was defined as 'a transitory emotional state or condition of the human organism that is characterised by subjective, consciously perceived feelings of tension and apprehension, and heightened autonomic nervous system activity.' A-States may vary in intensity and fluctuate over time (Speilberger, Gorsuch & Lushene, 1970; p. 3). The A-trait scale is concerned with general anxiety.

Considerable evidence was reported supporting the validity of the scale. The A-State scale showed good internal consistency reliability with correlations of .83 to .92. Concurrent validity was not reported for the A-state scale, but the A-trait scale correlated .75 to .85 with other anxiety scales. Construct validity was also high, as virtually all items significantly discriminated between 'norm' and 'exam' conditions. Correlations with

other personality measures revealed that high STAI scores were associated with a larger number of medical symptoms.

B. MANIPULATION CHECK.

Perceived control and perceived demand were assessed separately with two 5-item scales. The items were combined for administration in a 10-item scale, but were scored separately (task control items: 1, 3, 5_R, 8, 10_R; and demand items: 2, 4, 6_R, 7, 9). Item selection was based on Perrewe and Ganster's (1989) scale and aimed to provide a representative assessment of the control manipulation. Items 1, 2, 4, and 9 were from Perrewe and Ganster (1989). Items 3 (freedom to decide how I do my own work) and 7 (excessive amounts of work) were drawn from Quinn & Staines (1979) Facet-Specific Job Satisfaction measure. Items 5 (freedom to use my own judgement), and 8 (try my own methods of doing the job), were taken from the Minnesota Satisfaction Questionnaire (Weiss, Dawis, England & Lofquist, 1967). The scale correlated .90 with general satisfaction; test-retest reliability over one week was .89. Item 6 (the time to think and contemplate) was from Caplan's (1971) Subjective Quantitative Workload measure. Item 10 was written by the author, after pilot testing revealed ambiguity in a previous supervision item.

C. SATISFACTION.

Satisfaction with the task was assessed by three measures. First, the Gender-free version of the 7-point, 1-item GM Faces scale (Kunin, 1955) assessed overall satisfaction with the task. A second GM Faces scale asked 'how you would rate the task after having done it for a normal working week' (i.e. 40 hours), after Stone (1977).

The second measure was Stone's 10-item Semantic Differential (1977). Bipolar adjectives (e.g. boring-interesting, liked-disliked) were placed on a 7-point scale. Stone (1977) reported a coefficient alpha of .93 for the scale.

The Job Descriptive Index (Smith, Kendall and Hulin, 1969), 'work on present job' 18-item, 3-point scale was included as a widely used and valid satisfaction measure. Internal reliability coefficients reported for the scale range from .69 to .90. The scale is considered to have good concurrent, and construct validity (Cook, Hepworth, Wall & Warr, 1981). Correlations with overall satisfaction were moderate (.53 to .74). The Work scale correlated .44 with supervisory ratings (Kesselman, Wood and Hagen, 1974); organisational commitment .56 (Porter & Smith, 1970) and .51 (Stone & Porter, 1975); perceived autonomy .51 (Brief & Alag, 1975); and job orientation .96 (Dubin & Champoux, 1977). Perceived role conflict and role ambiguity correlated -.29 with the Work scale (Rizzo, House & Lirtzman, 1970).

D. PHYSIOLOGICAL AROUSAL.

The heart rate monitor (Polar Vantage XL^{TM} Transmitter) was strapped on the chest (worn next to the skin) of each subject. Pulse rate was displayed on a watch style monitor placed on the desk within the one metre range of the watch. The pulse rate was calculated as beats per minute averaged and displayed over 5-second intervals. Pulse rate was recorded for 30-second periods at the beginning and every 5 minutes (7 discrete time periods). Pulse rate was reported to be a construct-valid index of physiological arousal (Andreassi, 1980).

CHAPTER THREE

RESULTS

A 2 (control) x 2 (demand) x 2 (gender) analysis of variance was performed on the questionnaire data. The pre-test anxiety data were partialled from the post-test data to reduce individual difference effects in the error term. Perceived independent variables were dichotomised (median split), and analysed separately.

3.1 OBJECTIVE ANALYSIS

TASK CONTROL AND DEMAND MANIPULATION CHECK

The experimental manipulation for task control and demands was highly significant, and in the predicted direction. The control manipulation had a positive effect on perceived control ($F(1, 104) = 104.88$, $P<0.0001$, VAR 49%) (see Table 3.2). The high control treatment was perceived to have high control (72%), and the low control condition perceived as low control (41.6%) (see Figure 3.1).

Perceived demand was also in the expected direction ($F(1, 108) = 46.2$, $P< 0.0001$, VAR 26%). High demand was perceived to be more demanding (78%), and low demand represented a lower level of demand (55.5%) (see Figure 3.2).

The gender main effect was significant ($F(1, 104) = 5.43$, $p < .05$). Although males consistently reported a higher level of demand, statistical comparisons revealed no treatment condition in which gender was significant

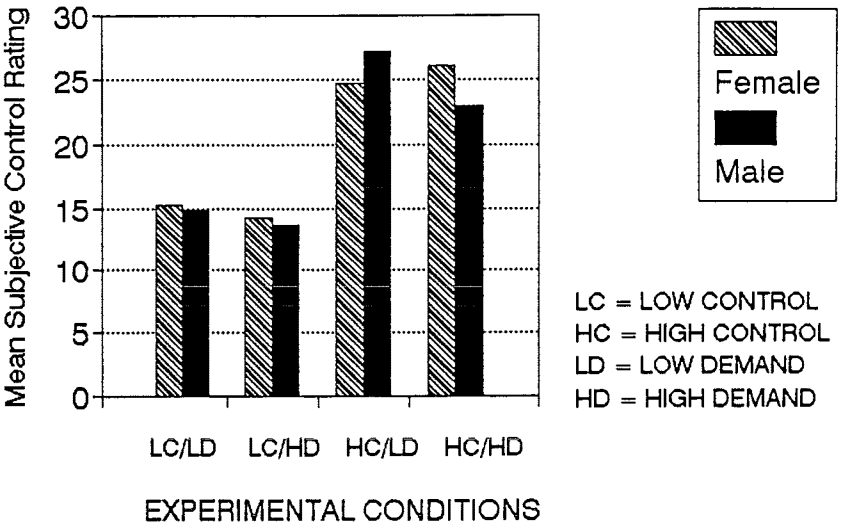


Figure 3.1: Mean Rating of Manipulated Demand and Control on Subjective Control

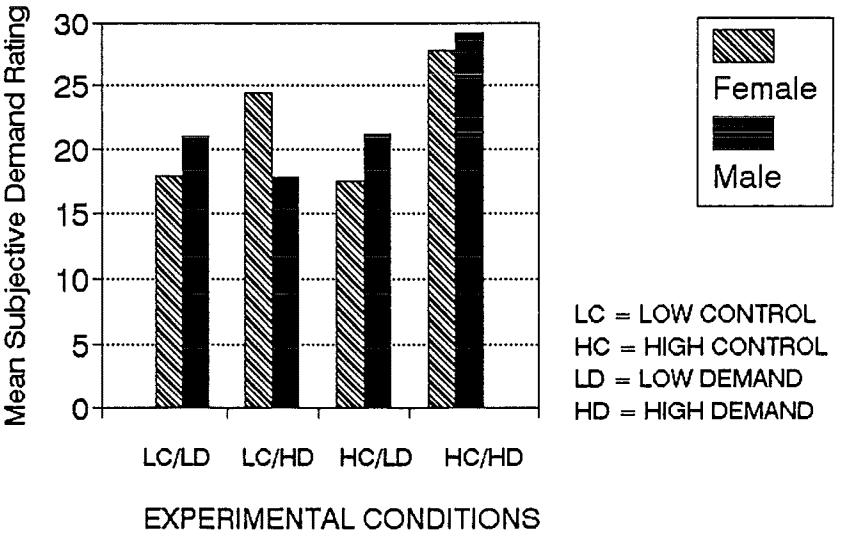


Figure 3.2: Effect of Manipulated Control and Demand on Mean Ratings of Subjective Demand.

AGE

Age means and standard deviations are presented in Table 3.1. Low-control subjects were significantly older than high-control subjects (F (1, 104) = 9.01, $p < .01$ VAR 7.6%) (see Table 3.2). Age and perceived control were negatively correlated ($r = -.195$, $p < .05$), (see Figure 3.3). No other measures were significantly correlated with age. Although, a small negative correlation between age and projected satisfaction approached significance ($r = -.182$, $p = .054$), shown in Figure 3.4.

Table 3.1 **Mean ratings of objective control and demand for age.**

AGE	CONTROL								
years	LOW				HIGH				
	LOW DEMAND		HIGH DEMAND		LOW DEMAND		HIGH DEMAND		Sample
Gender	F	M	F	M	F	M	F	M	
MEAN	25.3	21	21.3	22.6	19	18.9	20.4	19.6	21
SD	9.0	2.7	4.4	3.4	.75	1.3	6.3	1.8	5.4

Table 3.2 **F statistics for age, anxiety, subjective control and demand.**

F STATISTICS:	Control	Demand	Age	Anxiety
Subjective Control	104.9***	.86	9.0**	6.4*
Subjective Demand	1.5	39.3***	.02	4.2*
Gender	.15	5.4*	.82	3.7

*** $p < .0001$
** $p < .01$
* $p < .05$

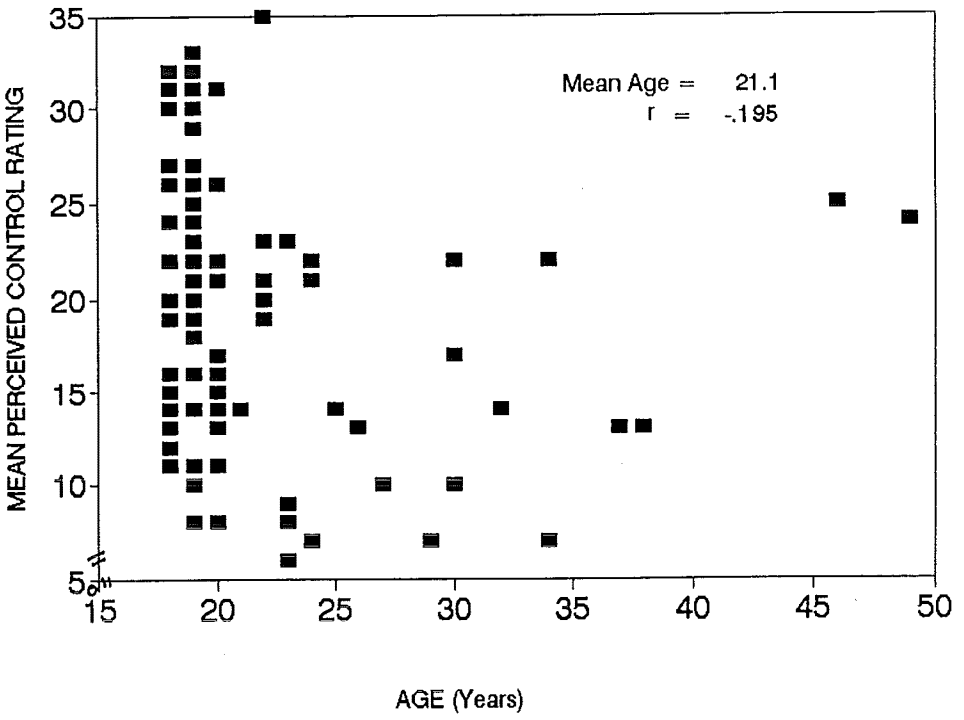


Figure 3.3. Correlation between Subject Age and Perceived Control.

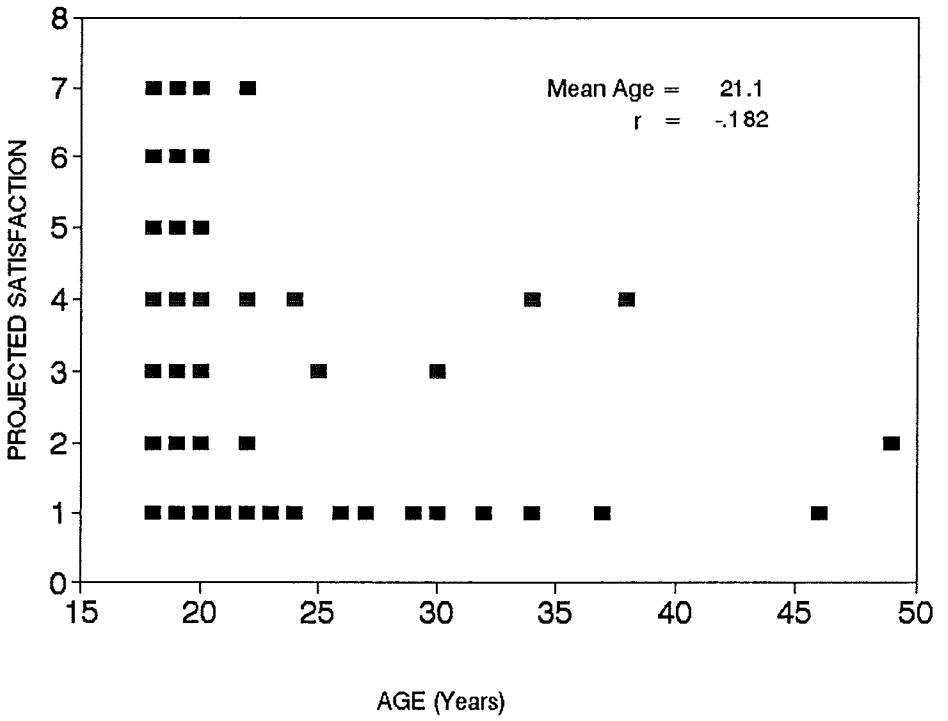


Figure 3.4. Correlation between Subject Age and Projected Satisfaction.

ANXIETY

Anxiety main effects were found for task control and demand (see Table 3.2). Anxiety increased at post-test for low control (mean 4.25) but did not for high control (mean -0.29), ($F(1, 104) = 6.36$, $p < .05$, VAR 5.3%). High demand had greater anxiety (mean 3.39) than low demand (mean 0.6) conditions ($F(1, 104) = 4.21$, $p < .05$) (see Figure 3.5).

Gender approached significance ($F(1, 104) = 3.72$, $p < .054$, VAR 5%), in that males tended to report higher levels of anxiety. There were no significant interaction effects.

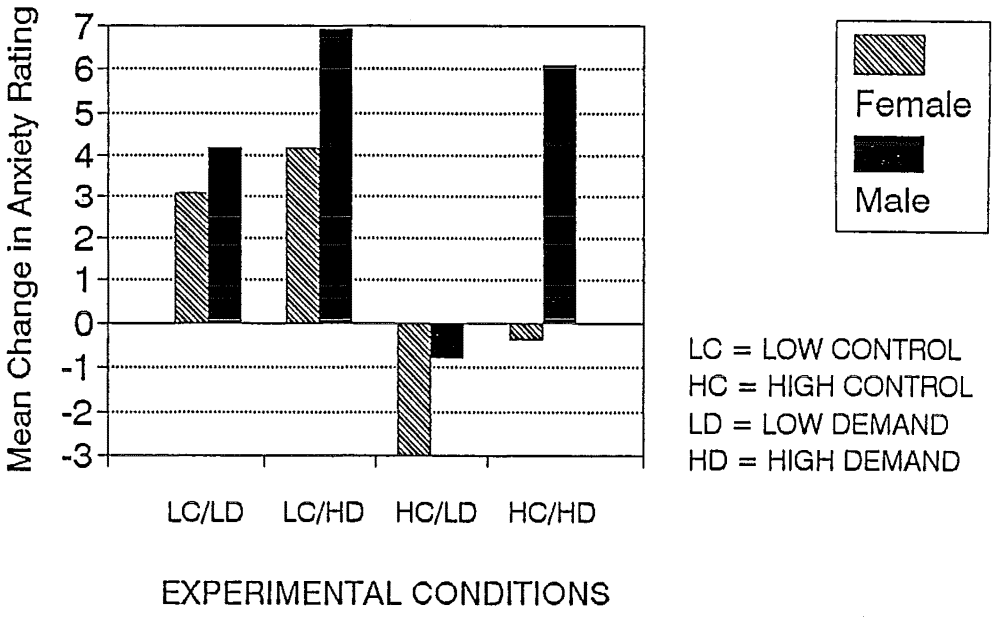


Figure 3.5. Effect of manipulated control and demand on change in anxiety from pre-test to post-test.

SATISFACTION

Three measures were utilised to assess satisfaction with the task, and one measure of projected satisfaction (after working a 40-hour week).

Overall satisfaction was assessed with the 'Faces Scale' and effects are shown in Figure 3.6. Satisfaction was higher in low-demand conditions ($F(1, 104) = 9.2$, $p < .01$, VAR 7.5%). A main effect was found for gender ($F(1, 104) = 3.98$, $p < .05$, VAR 3%) (see Table 3.3). Males reported less satisfaction than females in the high-control/low-demand condition ($t(26, 104) = 2.12$, $p < .05$). Comparisons revealed no other significant gender effects.

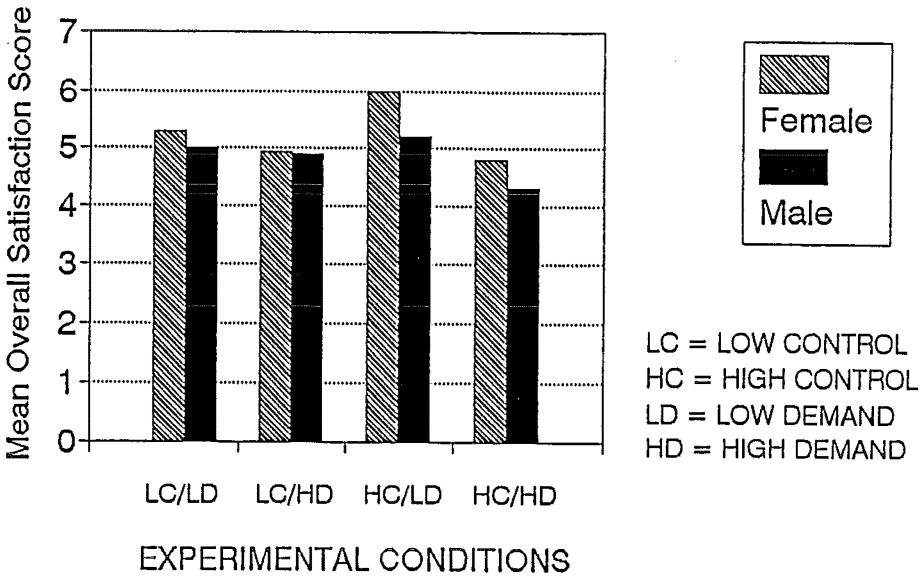


Figure 3.6. Effect of objective control and demand on overall satisfaction.

No main effects were found for projected satisfaction (after 40 hours work). Control approached significance ($F(1, 104) = 3.5$, $p = .061$, VAR 2.9%), the trend being slightly more satisfaction for high-control. The interaction between control and demand was significant ($F(1, 104) = 4.81$, $p < .05$, VAR 4%), as shown in Figure 3.7. As demand reduced, high-control satisfaction increased, whereas low-control maintained a low level of satisfaction regardless of demand.

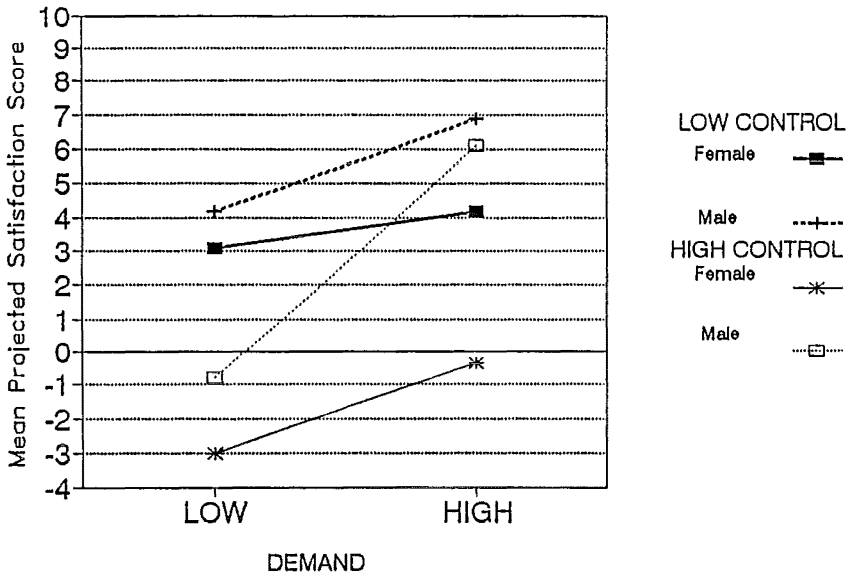


Figure 3.7. Interaction of objective control and demand for projected satisfaction.

Stone's Semantic Differential was the third satisfaction measure (see Figure 3.8). The main effect for control was significant ($F(1, 104) = 5.59$, $p < .05$, VAR 4.7%), satisfaction was greater for high-control than low-control conditions. The gender main effect was significant ($F(1, 104) = 6.46$, $p < .05$, VAR 5.4%), with males less satisfied than females. While every treatment condition followed this pattern, comparisons failed to find a significant gender effect.

Satisfaction assessed with the Job Descriptive Index found the main effect for control was significant ($F(1, 104) = 6.83$, $p < .05$, VAR 5.6%). High-control had more satisfaction than low-control (see Figure 3.9). The gender main effect was also significant ($F(1, 104) = 6.03$, $p < .05$, VAR 4.9%). A comparison indicated the only significant gender effect occurred in the low-

control/low-demand condition where males reported less satisfaction than females, ($t(26, 104) = 2.56$, $p < .05$).

Table 3.3 F Statistics for objective satisfaction measures.

F STATISTIC	SATISFACTION MEASURES			
	Overall	Projected	Semantic. Differential	Job Descriptive Index
Control	.09	3.5~	5.6*	6.8*
Demand	9.2**	3.0	1.8	.02
Gender	3.98*	1.6	6.5	6.0*
Control by Demand	3.54~	4.8*	1.1	2.14

** $p < .01$
* $p < .05$
~ $p = .06$

In summary, satisfaction tended to be greater in objective high control conditions. The effect was significant for two of the four measures, and a third scale approached significance. High task demand resulted in significantly less satisfaction on one measure. The interaction between control and demand was significant for projected satisfaction. As demand reduced, satisfaction increased for high-control, but not low-control conditions.

The main effect for gender was significant over three of the four measures. Males tended to be less satisfied with the task overall, but otherwise had a similar response pattern to females.

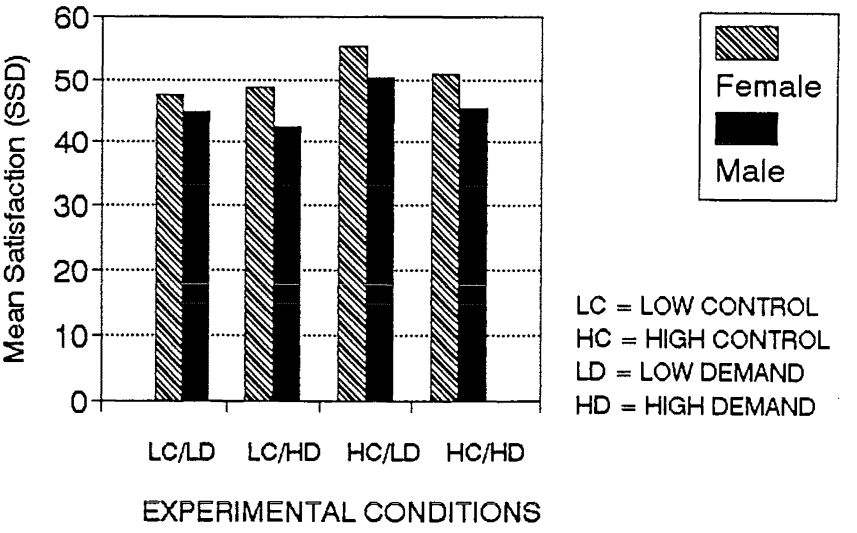


Figure 3.8: Effect of Objective Control and Demand on Mean Satisfaction (Stone's Semantic Differential).

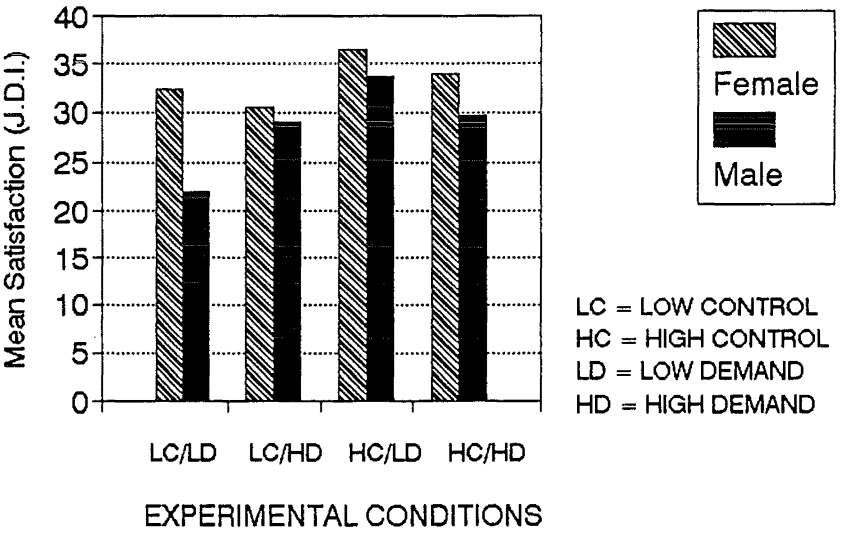


Figure 3.9. Effect of Objective Control on Mean Satisfaction (Job Descriptive Index).

PULSE RATE

A 2 (control) x 2 (demand) x 2 (gender) x 6 (time interval) analysis of variance was conducted on the pulse rate data. Separate analyses were conducted for actual pulse rate, and change in pulse rate (baseline data partialled).

Time was the only significant main effect ($F(6, 624) = 7.37$, $p < .001$). Several significant variations in pulse rate occurred over time, as illustrated in Figure 10. Pulse rate increased from a baseline of 82 beats per minute (bpm), to 84 bpm for the next 10 minutes ($F(1, 104) = 16.02$, $p < .001$), falling to 83 bpm at 20 minutes ($F(1, 104) = 4.3$, $p < .05$), then climbed to 85 bpm after 25 minutes ($F(1, 104) = 1.62$, $p < .01$), and tapered slightly to 84 bpm at 30 minutes (N.S.). Mean pulse rate during the task was always significantly higher than at baseline (base compared with 20 minutes. $F(1, 104) = 5.15$, $p < .05$).

The control by demand by gender interaction was approaching significance for actual pulse rate ($F(1, 104) = 3.78$, $p<.052$), but as the interaction did not hold when the baseline rate was partialled out, the effect can be attributed to individual pulse rate variance.

The control by demand by gender by time interaction was significant ($F(6, 624) = 2.19$, $p < .05$), (see Table 3.4). It is difficult to establish any clear interaction effects, particularly as no significant interaction occurred for any factors separately. For the first 5-minute period, pulse rate increased at a similar rate for three conditions, but the high control/high demand condition increased at a slower rate for females, and decreased for males. The 20 to 25 minute period saw the female low demand conditions increase at a faster rate than the high demand conditions; males recorded a slower increase in the low control/high demand condition.

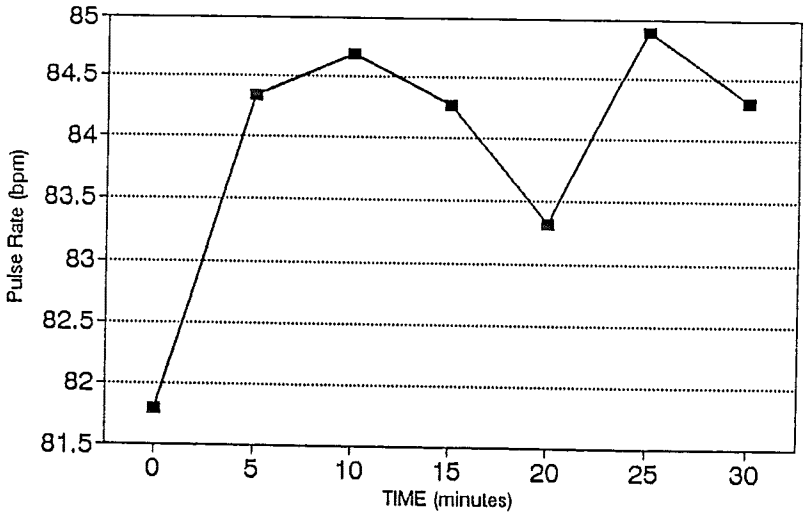


Figure 3.10 Mean pulse rate over time.

Table 3.4 Mean Pulse Rate over Control, Demand, Gender, and Time.

DEMAND	SEX	TIME (minutes)						
		0	5	10	15	20	25	30
		LOW CONTROL						
HIGH	F	82.3	85.26	84.8	85	88.47	85.05	82.05
	M	75.4	80.4	81.1	81.2	81.3	84.2	84.4
LOW	F	82.3	86.74	86.0	83.5	83.82	84.4	84.6
	M	86.0	88.78	88.89	88.78	87.0	88.33	88.56
		HIGH CONTROL						
HIGH	F	79.7	83.32	82.95	82.84	81.32	84.2	83.1
	M	83.1	84.78	85.44	85.22	83.56	83.22	83.56
LOW	F	86.8	88.2	89.4	88.00	87.79	88.53	87.9
	M	78.6	77.2	79.4	79.56	78.78	81.2	80.2

3.2 PERCEIVED ANALYSIS

AGE

There were no significant effects of perceived control and demand on age. The average age and standard deviation for each group are listed in Table 3.5.

Table 3.5. Perceived analysis: means and standard deviations for age.

AGE	CONTROL								Sample
years	LOW				HIGH				
	LOW DEMAND		HIGH DEMAND		LOW DEMAND		HIGH DEMAND		
Gender	F	M	F	M	F	M	F	M	
n	23	6	16	11	20	7	17	12	112
MEAN	22.7	23	19.9	20.6	22.4	19.9	20.4	19.6	21.2
SD	6.6	3.98	2.9	2.3	7.5	2.04	6.6	1.98	5.4

ANXIETY

Anxiety main effects were significant for perceived demand and control. Greater post-test anxiety was found for perceived low-control ($F(1, 104) = 4.25$, $p < .05$, VAR 3.6%) and high-demand conditions ($F(1, 104) = 3.84$, $p < .05$, VAR 3.3%). Most anxiety was recorded in the low-control/high-demand condition.

An interaction between perceived control and demand approached significance ($F(1, 104) = 3.65$, $p = .056$, VAR 3%) when gender was not included in the analysis. The effect did not hold when gender was included ($F(1, 104) = 1.99$, $p = .158$, VAR 1.6%). An examination of Figure 3.11 clearly

indicates that the interaction applied only to the female data. Female perceived control moderated the perceived demand/anxiety relationship. Planned comparisons indicate the female low-control/high-demand condition recorded a significantly higher anxiety level than all other groups (low-control/ low-demand t (37, 104) = -.26, $p < .05$; high-control/low-demand t (34, 104) = -3.0, $p < .01$; high control/high demand t (31, 104) = 2.87, $p < .01$).

Male anxiety tended to be higher in low control and high demand groups, but there was no interaction effect.

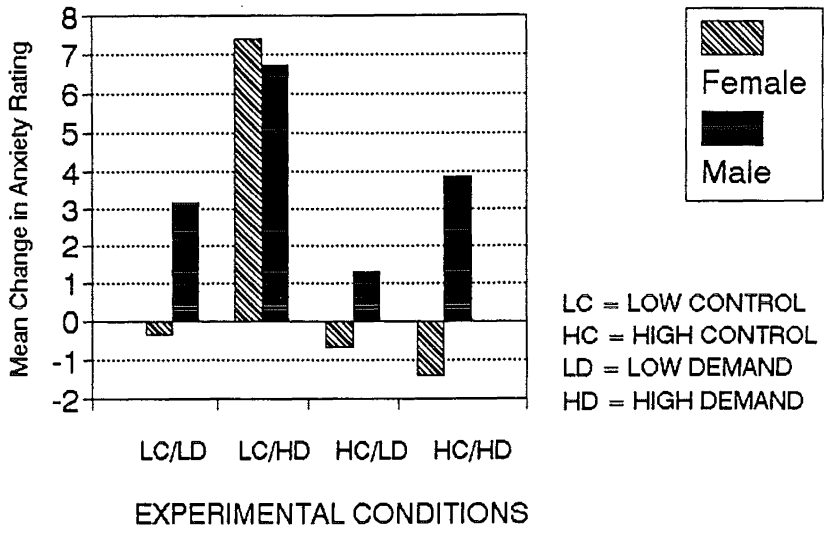


Figure 3.11. Effect of perceived control and demand on change in anxiety from pre-test to post-test.

TASK SATISFACTION

The F statistics for the perceived analysis of satisfaction measures are shown in Table 3.8. The overall measure of satisfaction (`faces scale') found the high perceived demand condition recorded lower levels of satisfaction ($F(1, 104) = 10.76$, $p < .01$, VAR 9%) (see Figure 3.12). There were no other significant results.

Projected satisfaction indicated that although no group wished to spend a week on the task, perceived low-control recorded significantly less satisfaction regardless of demand ($F(1, 104) = 6.55$, $p < .05$, VAR 5.4%) (see Figure 3.13).

Stone's Semantic Differential (SSD) had a main effect for control where the perceived high-control group reported more task satisfaction ($F(1, 104) = 8.66$, $p < .01$, VAR 7%) (see Figure 3.14). A main effect was also found for gender, males were slightly less satisfied than females ($F(1, 104) = 6.02$, $p < .05$, VAR 5%). The trend was consistent for every group, planned comparisons indicated gender did not differ significantly within any one perceptual group.

The job descriptive index (JDI) found high-control subjects were more satisfied regardless of demand ($F(1, 104) = 7.45$, $p < .01$, VAR 6%) (see Figure 3.15). A main effect was found for gender with females being more satisfied than males ($F(1, 104) = 5.51$, $p < .05$, VAR 4.6%).

Perceived high-control groups reported greater satisfaction over three of the four measures. Females recorded more task satisfaction than males (two scales), otherwise response patterns were similar. High-demand conditions recorded lower satisfaction on the overall satisfaction scale.

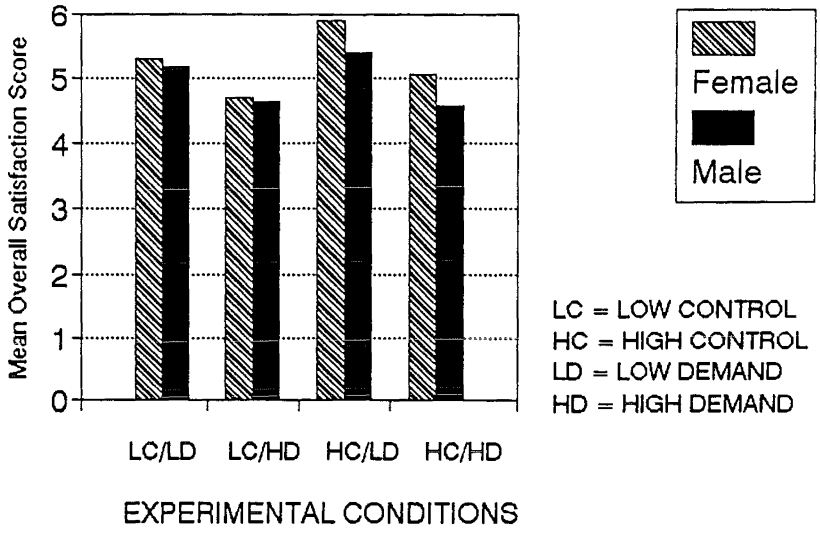


Figure 3.12. Effect of perceived control and demand on overall satisfaction.

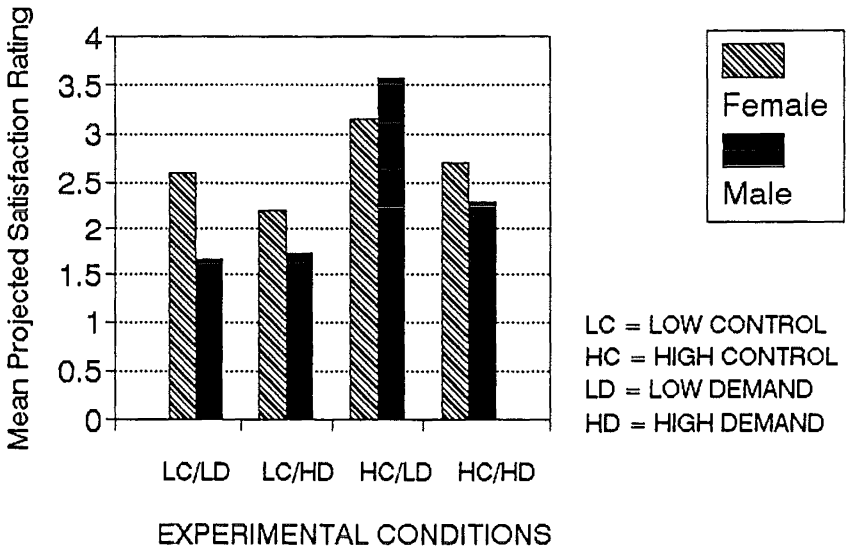


Figure 3.13. Effect of perceived control and demand for mean projected satisfaction.

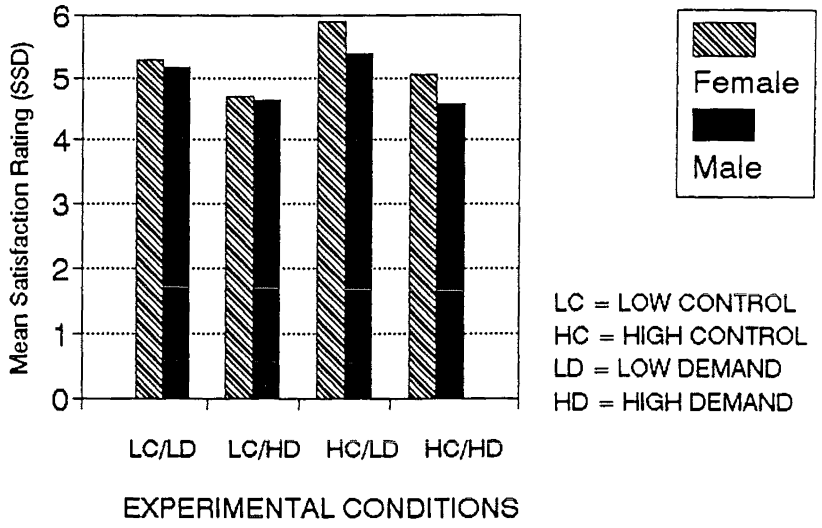


Figure 3.14: Effect of Perceived Control and Demand on Mean Satisfaction (Stone's Semantic Differential)

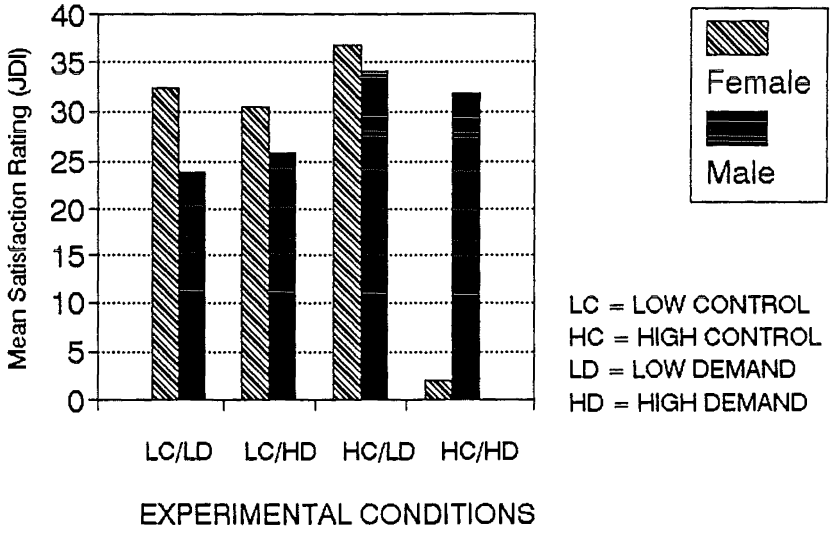


Figure 3.15: Effect of Perceived Control and Demand on Mean Satisfaction (Job Description Index).

Table 3.6. **Perceived analysis: F statistics for anxiety and satisfaction measures.**

F statistics	Anxiety	Overall	Projected	S. Diff.	JDI	Age
Control (A)	4.25*	1.85	6.55*	8.66**	7.45**	.92
Demand (B)	3.8*	10.76**	2.14	1.47	.73	3.05
Gender (C)	2.2	1.7	.94	6.02*	5.5*	.19
A x B	1.99 (p= .158)	.39	.89	.24	.79	.56
Seperate analysis: (no gender variable)						
A x B	3.64 (p= .056)					

**p < .01
*p < .05

In general, results for objective and perceived analyses were very similar. Control main effects were found for anxiety and two of the four satisfaction measures (SSD and JDI). An additional main effect for projected satisfaction was significant for the perceptual analysis but marginal in the objective results. Objective and perceived demand main effects were significant for anxiety and overall satisfaction. Interaction effects revealed different results for objective and perceptual analyses. The significant interaction for projected satisfaction was evident only for objective demand and control. The marginal anxiety interaction was only evident in the perceived analysis.

Objective and perceived control explained 5 to 7% of the .satisfaction variance. The effect of demand was slightly stronger (7.5 to 9%), but limited to the overall satisfaction scale. The effect size for objective and perceived demand on anxiety was 3.5%, and 4 to 5% for control. Control and demand

interaction effects explained 4% of the variance for projected satisfaction, and 3% for projected anxiety (gender excluded from analysis). Means and standard deviations are presented in Appendix C, analysis of variance summary tables are listed in Appendix D.

CHAPTER FOUR

DISCUSSION SECTION

4.1 INTERPRETATION OF RESULTS

The study found partial support for Karasek's job-strain model (1979). Main effects were similar for perceived and objective analyses.

CONTROL

Hypothesis 1 was supported as control was positively related to satisfaction and negatively related to anxiety. Significant main effects were found for objective and perceived control on anxiety and most satisfaction measures. There was no effect for pulse rate. This result is consistent with a strong body of research linking control with reduced strain, and lack of control with adverse outcomes (e.g. Thompson, 1981; Karasek et al, 1981). The association was stronger than previously found in laboratory research examining the effect of control on job related strain. Perrewe and Ganster (1989) found significant control effects only for perceived control (manipulation check) and one anxiety scale. A multidimensional operationalization of control was utilised in the present study. This approach precluded examination of the separate effects of each control dimension. A global approach was chosen as it was expected that a stronger manipulation of control would be obtained by including several control dimensions. This seemed a closer approximation to actual job conditions,

where a worker may experience varying degrees of control over a range of dimensions (Ganster, 1988).

The relationship between different dimensions of control is not well understood. Ganster (1988) has suggested a range of research questions to help identify the impact of various aspects of control. Control may be more important in certain areas, for example, or control over one dimension may compensate for lack of control in another.

It seems reasonable that control over factors central to task completion would reduce strain more than control over trivial or irrelevant factors (Ganster, 1989). With regard to the present study, free choice in kite design and decoration most likely provided a greater degree of control than either choice over a rest break or keeping the desk tidy. This may have been a major contributing factor in achieving a relatively strong manipulation of control. The task was creative for both high and low control conditions as subjects were required to make exactly the same kites. The task was probably more creative for high control subjects as they had a degree of self expression (in choice of design, colour and decoration) not permitted in the low control condition. This would enable a greater amount of discretion in selecting actions to cope with job demands.

Perrewe and Ganster (1989) suggested that control may need to be meaningful or important to a person before it acts as a moderator of demand on satisfaction. Actual jobs are clearly more meaningful to individuals than an experimental task. Laboratory studies often provide incentives and have value for research purposes. However, effort on the simulated mail sorting task had no direct productive value, and the task did not appear to be intrinsically satisfying. The kite making task may have been more meaningful, as subjects were informed the kites had a useful purpose (given to subject, or offered to children), and the task was creative.

The goal oriented conceptualisation of control (Frese, 1989) seems compatible with the concept of meaningful control, and emphasises individual factors in explaining control effects. If a task is irrelevant to a person's goals, no negative consequences are predicted to be associated with an absence of control. Each person is considered to have a hierachy of goals with control becoming more important as goals reach further up the scale. Factors such as exposure time and level of risk also impact on the equation.

An alternative explanation for the differential control effect may be that the low control manipulation approximated a situation of relative deprivation. Low control subjects were aware that more choices were available than they were permitted to exercise. All subjects were provided with a complete range of materials, but for low control subjects, the selection was dictated by the sample kites. There is some evidence to suggest that relative lack of control may result in higher strain than experienced in other low control situations (Glass, Reim & Singer, 1971).

The present study succeeded in finding a stronger effect of control for satisfaction and anxiety than comparable laboratory research. Unfortunately it was not possible to determine which dimensions of control accounted for the effect. An assessment of how meaningful the task is to the subject is likely to offer some explanatory value. It is also possible that the availability of a wider range of options than low control subjects were permitted to exercise further reduced the level of control.

DEMAND

The second hypothesis predicted that high task demand would result in more strain. Demand was positively related to anxiety, but the effect was weaker for satisfaction. High demand resulted in lower task satisfaction on only one of the four satisfaction measures. The effect of demand on satisfaction was weak in relation to other research including laboratory

studies (e.g. Perrewe & Ganster, 1989). Quantitative work overload has consistently been associated with greater strain (e.g. Westman & Eden, 1992) including increased risk of coronary heart disease (Karasek, Baker, Marxer, Ahlbom & Theorell, 1981).

The moderate effect of demand in the present study may have been due to the levels of manipulated demand being too similar to reveal strong differential effects (low demand 56%, and high demand 78%). The level of demand in Perrewe and Ganster's (1989) study was described as high (1000 envelopes to be sorted in 20 minutes) and moderate (750 envelopes). The manipulation was significant and explained 36 percent of the variance, compared with 26 percent in the present study. However, it is difficult to compare subjective ratings of demand as they were not reported in Perrewe and Ganster (1989).

INTERACTION EFFECTS

Hypothesis 3 predicted that control would reduce the effect of demand on experienced strain. The evidence of interaction effects was modest. The objective analysis revealed a significant interaction for projection satisfaction and a marginal interaction for overall satisfaction. A further marginal anxiety interaction was found with the perceived analysis.

Projected satisfaction was higher only under conditions of objective high control and low demand. A similar, although marginal ($p < .06$), interaction was found for overall task satisfaction. The interaction was consistent with the `low strain' quadrant for projected satisfaction. There was no support for the predicted moderating effect of control on satisfaction at high levels of demand. Similar patterns of interaction indicate that trends were applicable for both high and low levels of reported satisfaction.

A marginal interaction occurred for perceived control and demand on anxiety. Female anxiety was higher with increased demand only under conditions of low perceived control. Male results showed predicted trends for control and demand on anxiety, but were not suggestive of an interaction. The female pattern of interaction was consistent with that predicted by the job-strain model (Karasek, 1979). Perrewe and Ganster (1989) found a similar marginal interaction ($p < .1$) for perceived demand and control on anxiety. Subject gender was not mentioned in the study, so it was not possible to compare gender effects. The gender difference in the present study should be viewed with extreme caution due to the small male sample.

The laboratory is known to be a restricted environment in which to measure job strain effects (Perrewe & Ganster, 1989; Kasl, 1989). The interaction effects provide partial support for the job-strain model. The result is expected to be a conservative estimate of actual workplace effects, although evidence for stronger workplace interactions is not yet clearly established (Ganster, 1989; Kasl, 1989).

PHYSIOLOGICAL AROUSAL

The pulse rate results did not support the job-strain model. None of the predicted effects were found for pulse rate. While physiological effects do occur in response to aversive laboratory situations (e.g. Glass Reim & Singer, 1971). The absence of a physiological effect for control and demand is consistent with previous laboratory studies of occupational stress (Perrewe & Ganster, 1989). This may reflect the relatively weak manipulation of variables typically obtained for occupational stress in the laboratory. In the present study, the demand levels may have been too similar to produce a differential effect on pulse rate. It is likely that control in a situation of work overload may not have the same physiological impact as control over an aversive event (Perrewe & Ganster, 1989).

Physiological arousal increased over time as a result of working on the task. This provides evidence that the task was stress inducing, at least to some degree.

AGE

Older subjects were over represented in the objective low control groups. This is likely to account for the small negative correlation observed for age and perceived control (-.195). No age differences were observed on ratings of perceived control within low control conditions.

A further age effect was a small negative correlation with projected satisfaction (-.18), that approached significance. This may also be a reflection of the larger proportion of older subjects in low control conditions. However as the effect was not found for other satisfaction measures, it is also possible that older subjects were slightly less positive about the prospect of working on the task for a week.

There were no significant age differences for perceived satisfaction.

GENDER

Males reported more task demand and less satisfaction than females. Males were also over represented in the high perceived demand quadrant. This may reflect their actual experience of demand as observations suggest that males experienced more difficulty with aspects of the task (e.g. use of a needle and thread). The differential gender effect may be peculiar to this group or spurious, due to the small male sample.

4.2 GENERAL DISCUSSION

The job-strain model (Karasek, 1979) was partially supported by the results of the present study. An objective interaction for projected satisfaction was revealed, and the marginal perceptual interaction on anxiety was consistent with that observed by Perrewe and Ganster (1989). As the laboratory probably provides a conservative test of the model, observed effects are expected to be stronger in the real work environment.

Satisfaction effect sizes were in the region of 8 to 9 percent for demand and 5 to 7 percent for control. Anxiety effects were 3.5% for demand and 4 to 5 percent for control, with interaction effects 3 to 4%. The control effect was slightly stronger than reported by
Perrewe and Ganster (1989), where a change in variance of 2.6 percent was reported for perceived control on anxiety. There were no effects for perceived or objective control on satisfaction.

The effect of demand on satisfaction was larger in Perrewe and Ganster (1989) than for the present study. The faces scale revealed an effect of 12 percent for objective and 18 percent for perceived demand, an effect of 8% occurred for perceived demand on Stone's Semantic Differential. The perceived interaction for anxiety was 2.3 percent. Although effect sizes were rather small in the present study, they were of a comparable size with those reported in similar laboratory research. Due to limited task control variance, this type of laboratory study would be expected to have a reasonably small effect size.

Frese (1985) reported correlations of .2 (explaining 4 percent of the variance) in the relationship between work factors and illhealth. However, the variance was restricted as most sick people would not be working. While officially a small effect size (Cohen, 1977), it may still have practical utility. Frese (1985) suggested that it is reasonable to consider the work

situation as one of many variables that influence health; and the effects may be large for small sectors of the population. Differences in job control over widely different occupation groups can be expected to show stronger effects (Karasek, 1989).

The relationship between objective and perceived control revealed some interesting effects. Objective control had a negative impact on strain that was not always consistent with perceptual variables. The projected satisfaction interaction, for example, was present only for the objective analysis. This is in contrast with Miller's (1979) hypothesis that the perception of control is necessary before it has a moderating effect on strain. Perrewe and Ganster (1989) also concluded that perceptual variables were a more important indicator of the effect of control on strain than were objective factors. Results of the present study supported a fairly close (although not identical) relationship between objective and perceived control. This suggests that it is appropriate to study objective work conditions directly, rather than rely on perceptual variables for control to show an impact on strain. Further research is needed to more fully understand the relationship between perceived and objective control.

A growing body of research has found at least partial support for the job-strain model (e.g. Karasek, 1979; Alfredsson & Theorell, 1983; Landsbergis 1988). However, other studies have failed to find effects (Reed et, al, 1989; Payne & Fletcher, 1983). Research supportive of the job-strain model has been criticised on methodological grounds (e.g. Ganster, 1989; Kasl, 1989). Kasl (1989) concluded that evidence for the predicted interaction effect was rather weak. The present study also succeeded in finding only modest support for the interaction. Karasek (1989) accepted the argument that model would be strengthened by the presence of a multiplicative interaction term, but claimed the validity of the model does not rely on this. The practical implications of the model would not be adversely affected if

demand and control were shown to have an additive relationship. If Karasek's (1989) argument is to be accepted, predicted control effects observed in the present study may be regarded as providing considerably stronger evidence for the model.

4.3 RETROSPECTIVE EVALUATION OF THE PRESENT STUDY

SAMPLE

The size of the male sample was too small as it lacked sufficient power to be representative of the population. Results for males should be regarded with extreme caution, as effects may be peculiar to this group. It was intended that the sample would comprise equal numbers of males and females, but there was an insufficient number of male volunteers.

The occurrence of unplanned age effects was problematic. This would best be avoided by selecting a sample very similar in age.

The student sample would most likely have a different reaction to the task than people who worked in assembly or craft occupations. It is likely that the task would be less important to a student sample, and this would have a conservative influence on results.

TASK VARIABLES

The kite task was developed from a combination of factors associated with creative assembly work. The task had several characteristics in common with the work of sewing machinists. However, the replication of a job known to be stressful would have enabled a more realistic assessment of occupational stress. The development of a work sample over a longer period (day or week) would also have provided a stronger test of the model. This

type of study was not feasible due to resource limitations. Equipment and materials needed to be affordable. Time spent on the task was restricted in order to be able to attract volunteers.

The task provided a test of the job-strain model that approximated certain conditions of stressful work, but the laboratory task would have constituted a rather minor source of stress.

MEASURES

While the STAI and JDI were reliable measures, the job demand and control scale was comprised of several measures. The reliability of the combined scale was unknown, although an effort was made to select reliable items (at least .8). A composite measure was necessary as the original scales included items that were not appropriate for the laboratory situation.

ADMINISTRATION

The experiment was conducted either individually or with several subjects. This created a degree of variance, but it was not considered to have a bearing on the experimental manipulation as subjects were not permitted to interact. Previous researchers have also conducted experiments in small groups (e.g. Perrewe, 1986, 1987).

While ideally, the experiment would be conducted in exactly the same way every time, in practice it was difficult to keep every extraneous factor entirely constant. A limitation on room availability, for example, meant the experiment was conducted in three separate rooms. Slight variations that did occur were spread across experimental conditions.

PHYSIOLOGICAL AROUSAL

Continuous monitoring may have been more sensitive to minor variations in pulse rate. However, there also seemed more risk that

electronic data could be `lost', or data for one subject could be confused with another. Sampling seemed to be a safer method of collecting data, and was considered adequate for the purposes of the present study.

CONTROL MANIPULATION

As the operationalisation of control was multidimensional, it was not possible to isolate the impact of each dimension of control. A priority of the present study was to develop a strong manipulation of control in order to provide an adequate test of the job-strain model (Karasek, 1979). It is left to future research to delineate the impact of each control dimension.

The manipulation of creativity in the present study appeared compatible with Karasek's (1979) definition of control over tasks, and selecting actions to cope with job demands. The inclusion of creativity as an item in a decision latitude scale (Karasek, 1979) has been criticised as overlapping or confusing control with theoretically distinct constructs (Sauter, & Hurrell, 1989). Although related to control, the presence or absence of creativity does not in itself appear to measure control. This highlights the difficulty of manipulating control in an environment where in Sauter and Hurrell's (1989) words, "we are lacking for theory to help define the conceptual boundaries of the control construct..." (p. xvi). If isolating control from related concepts is difficult in an experimental situation, it would be compounded in the work setting.

As part of the experimental manipulation, more emphasis was placed on low control subjects to complete the feedback sheet. It is possible that this created a slightly higher level of demand in the low control condition. However, any effect would be minor, as the perceived demand scores for high and low control were very similar.

The supervision dimension may have been problematic, as it was difficult to maintain a high level of consistency in the amount of attention

given to each subject. Although, the control manipulation was effective with respect to the provision of assistance. The supervision manipulation would be improved by controlling for the amount of attention each subject received.

DEMAND MANIPULATION

The demand manipulation was weaker than would be expected from existing research. It is expected that a stronger manipulation would be achieved by reducing the level of demand in the low demand condition. The high demand condition was sufficiently demanding as only one subject succeeded in making seven kites.

Other forms of occupational demand may have differential effects on strain.

LIMITATIONS ASSOCIATED WITH THE LABORATORY ENVIRONMENT

Constraints associated with the study of occupational stress in the laboratory have a conservative effect on results. A job is obviously more important to a person than a laboratory task. The incentive of chocolate fish and a raffle prize is not as important as regular income. The effect of working on a task for a short time is considerably different from doing the same activity as a job. This was evidenced in the present study, as subjects found the task satisfying over a 30-minute period, but regarded doing it for even a week as unsatisfying.

Laboratory research is only able to study effects arising from initial exposure to job demands (stress). It is usually only feasible (or appropriate) to study these outcomes in the short-term. Long-term strain effects may be different from those evident in the short-term, and some effects may only occur after long-term exposure to certain job conditions (Kasl, 1989).

The development of laboratory manipulations that realistically simulate stress associated with the work environment is recognised as extremely difficult (Kasl, 1989), although a work simulation experiment over a period of several days (or longer if feasible) would be expected to produce a more realistic effect. Particular care must be taken before generalising the results of laboratory studies to the prediction of specific outcomes in the work place.

4.4 FUTURE RESEARCH

Further laboratory research is needed to isolate the impact of separate control dimensions on job related strain. Control has been divided into four general types (Thompson, 1981), and behavioral control in itself is a multidimensional construct. Ganster (1988) suggested that control in one dimension may compensate for lack of control in another, with effects crossing between the job and other aspects of life. Additive and interactive relationships may also occur between control domains. The effect of organisational interventions on specific aspects of control would be examined more easily with a multidimensional control perspective (Ganster, 1988).

The present study manipulated work overload on a creative assembly task with a slightly longer cycle time than that utilised by Perrewe and Ganster (1988). The effect of control on various types of jobs could be examined further, particularly as this may vary in accordance with how meaningful or relevant the task is to the goals of an individual. The strain effects associated with different types of job demand could also be examined (Perrewe & Ganster, 1988). Control in situations of adversity (e.g. shock, cold

pressors, noise) seem better understood than in situations of work related demand.

Further research is needed to fully understand the relationship between objective and perceptual variables. The present study found a rather similar effect on strain for both variables, although differences also occurred. In the present study some of the variance seemed to reflect differences between subjects in actual experience of the task. A range of individual difference variables are also known to contribute to this relationship (e.g. Type A behaviour, Kushnir & Melamid, 1991) and attributional style (Perrewe, 1986).

The influence of the job-strain model on productivity has not been clearly specified and may be an interesting avenue for further research. Managers may be unwilling to increase employee control for fear of reductions in productivity. However in discussing the available evidence, Ganster (1989) suggested that workers exercise control to improve the person-environment fit, and may actually set more difficult goals than would be expected by others.

Research has indicated that the loss of control has a more serious impact on strain than not having experienced control. This is of particular concern given the Swedish evidence that most job reorganizations were in the direction of reduced worker control (Karasek, 1990). Influence over the process of change followed by reduced control in a restructured job was associated with additional strain (Karasek, 1990). This suggests that raised expectations followed by disappointment may create a lower perception of control than normally assigned to a situation. Loss of control relative to stable or increasing control is potentially an important factor in occupational research (Ganster, 1989). Relative lack of control has also been associated with increased strain (Glass, Reim & Singer, 1971). More research is needed to adequately address this issue.

Ultimately the work place is the focus of concern for the job-strain model. There is a recognised need for more job redesign interventions (Karasek, 1990). It is important that reasonably long-term exposure to work conditions and strain effects are measured.

There is a growing awareness in organisational literature on the value of developing cost/benefit analyses of human resource programs (Cascio, 1987). The job-strain model is concerned with the redesign of work to increase employee control. At present this is directed at the job or task level, but has wider implications for the organization as a whole.

Organisational interventions would be assisted by clear, preferably quantifiable, information on the effects of increased worker control. It would be equally valuable to be able to identify the full costs, both human and organisational, of low control jobs.

A comprehensive assessment consistent with the model would consider the impact on health, productivity, learning, and strain effects such as withdrawal or political behaviour. The short-term impact should be considered separately from effects over the longer term. The relationship between job strain and health is one important factor that requires a long-term assessment period.

In addition to emphasis in the health area, there is a need for more research on the objective examination of organisational outcome variables. Some interest has already been shown in this direction, with the examination of variables such as absenteeism, tardiness, turnover and productivity. Janis (1983) considered related factors of role conflict and ambiguity. Strain has the potential to impact on a wide range of organisational variables that can be expected to vary over time. Additional variables that could be examined further include error and accident rates.

The job-strain model requires further research to establish the extent of interaction effects between demand and control, and also the degree of

impact. This would be assisted by improved measures of control and clear delineation of the control construct. Future research on the job-strain model is clearly directed toward development and testing of a more comprehensive model. The model has already been expanded to include social support and physical demands (Karasek & Theorell, 1990). This will direct research toward further examination of environmental and individual factors.

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APPENDICES

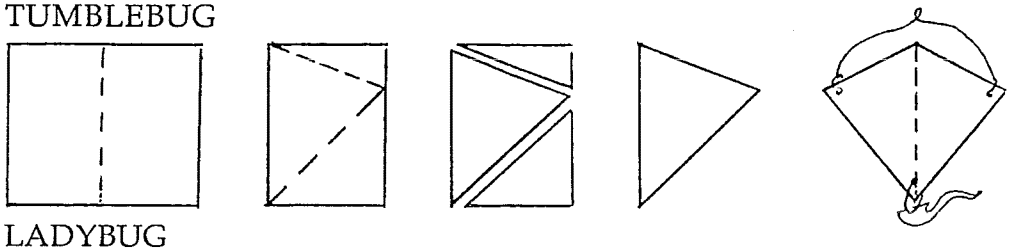
APPENDIX A (I)

DIAGRAM KITE INSTRUCTIONS

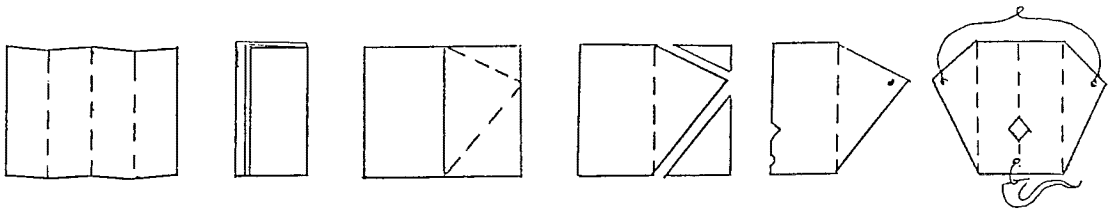
KITE DESIGNS

TO ATTACH KITE TAIL: Take a length of crepe paper, fold in half and attach the middle to the kite.

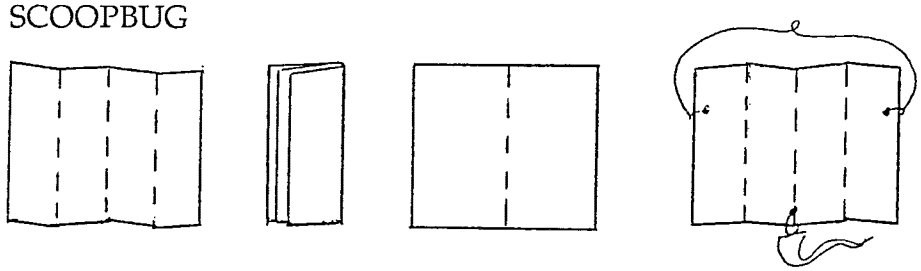
1. TUMBLEBUG



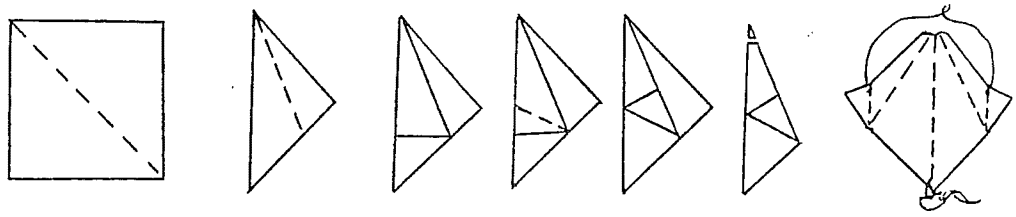
2. LADYBUG



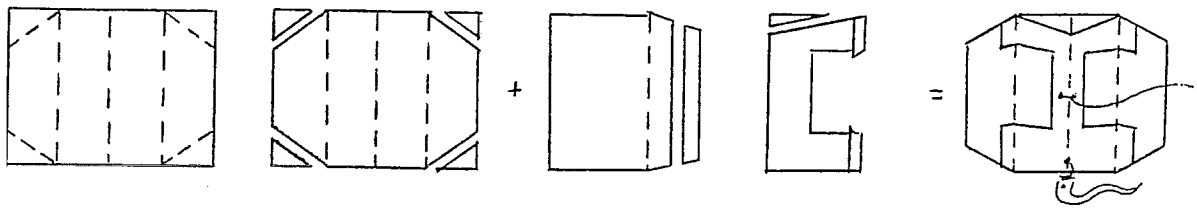
3. SCOOPBUG



4. DOODLEBUG



5. JUNEBUG



APPENDIX A (II)

INSTRUCTIONS FOR

LOW-CONTROL CONDITION

LOW CONTROL VERBAL INSTRUCTIONS

"As a thankyou for participating in this experiment you will receive chocolate fish, and be entered into a prize draw with $50.00 first prize, two prizes of $25.00 and two of $10.00. Your kites may be returned at the end of the study, or be offered to childrens charities.

First, complete the Self-Evaluation Questionnaire, for how you feel at this moment. Afterwards I will explain the kite making task".

"The kite-making task has similar characteristics to many that might be found in industrial organisations. Please look at your instruction sheet" high demand condition: "7 kites are to be made in 30 minutes" [low demand condition: "aim to make 3 kites in 30 minutes, but dont worry if you can't get all 3 made"]. "sample kites are laid out in pairs beside you, work following the order, beginning with the nearest pair. It is important that you complete each of the following steps for two kites at a time. The method was then read with the subjects. "The aim is to copy your sample kites as near as possible, so use the same colours as the sample kite for the shape and tail, your decoration should also be a close copy of the sample kite. If a sample kite differs from the `design' sheet, always follow the sample kite.

Every kite must have a tail attached, a kite string, and be decorated, to be counted as a complete kite".

The kite design sheet was then explained to subjects (the relevant places were indicated on the kite design sheet). Subjects were shown the fold lines (dotted) and cut lines; that the kites began with a rectangular shape, apart from the Doodlebug which started with a square. The Junebug was two pieces of paper for the first two steps, then one was cut down and glued onto the first sheet. Any questions?".

The feedback sheet is to be filled in, so the experimentor can ensure the required pace is being maintained. Please check your feedback sheet to see if you are entitled to a one minute rest break. If so, this must be taken at the time specified on your sheet.

Your work area must be kept tidy at all times. All scrap paper and thread is to be placed in the bin provided.

Your pulse rate will be recorded at 5-minute intervals while you are working on the task. After 30-minutes you will be asked to stop work, and fill in a questionnaire. Are there any questions?.

I will record your pulse rate now, please do not start work until I tell you".

APPENDIX A (III)

HIGH-CONTROL INSTRUCTIONS

HIGH CONTROL VERBAL INSTRUCTIONS

"As a thankyou for participating in this experiment, you will receive chocolate fish, and be entered into a prize draw with $50.00 first prize, two prizes of $25.00 and two of $10.00. Your kites may be returned at the end of the study, or be offered to childrens charities.

First, complete the Self - Evaluation Questionnaire for how you feel at this moment. Afterwards I will explain the kite making task".

"The kite-making task has similar characteristics to many that might be found in industrial organisations. Please look at your instruction sheet" high-demand condition: "7 kites are to be made in 30 minutes" [low-demand condition: "aim to make 3 kites in 30 minutes, but dont worry if you can't get all 3 made"].

"Kites may be selected from the `design' sheet, be a variation of these, or completely your own design. All kites must have a tail attached, a kite string, and be decorated in some way, to be counted as a complete kite".

The kite design sheet was then explained to subjects, (the relevant places were indicated on the kite design sheet). Subjects were shown the fold lines (dotted) and cut lines; that the kites began with a rectangular shape, apart from the Doodlebug which started with a square. The Junebug was two pieces of paper for the first two steps, then one was cut down and glued onto the first sheet. "Please ask questions if you need help at any time". Subjects were also shown how to use the needle threader.

"The feedback sheet may help you to manage your time, and keep a tally of your progress. A one minute rest break is available which can be taken at any time during the work period. If you do have a rest break, please record the time on the feedback sheet. Your pulse rate will be recorded at 5-minute intervals while you are working on the task. After 30-minutes you will be asked to stop work, and fill in a questionnaire. Are there any questions?. I will record your pulse rate now, please do not start work until I tell you".

APPENDIX A (IV)

TASK INSTRUCTIONS:

LOW-CONTROL/ LOW-DEMAND CONDITION

TASK INSTRUCTIONS

Aim to complete 3 kites in 30 minutes.

Each kite must be decorated, have a tail attached, and kite string tied.

METHOD

Kites are to be made in the order presented.

Complete each of the following steps for two kites at a time:

1 Make the kite shapes (i.e. fold and cut).

2 attach kite string (string must reach above top of kite).

3 attach kite tails.

4 decorate by copying the design on the sample kite exactly.

Make the third kite by repeating steps 1-5.

QUALITY STANDARD

. kite folded evenly,

. kite string and tails attached in correct place,

. kite string is slightly longer than the top of the kite,

. kite decoration is a close copy of the sample kite.

FEEDBACK SHEET

The time sheet is to be completed so the experimentor can ensure the required pace is being maintained.

Completed kite's (number)	Time Expected (minutes)	Time taken
2	20	.....
3	30	.....
.....		.....
.....		.....

REST BREAK

a) You are not permitted to have a rest break.

b) You have been allocated a one minute rest break.

This must be taken at the time indicated below.

Time of rest break: _____

APPENDIX A (V)

TASK INSTRUCTIONS:

LOW-CONTROL/ HIGH-DEMAND CONDITION

TASK INSTRUCTIONS

7 kites are to be completed in 30 minutes.

Each kite must be decorated, have a tail attached, and kite string tied.

METHOD

Kites are to be made in the order presented.

Complete each of the following steps for two kites at a time:

1 Make the kite shapes (i.e. fold and cut).

2 attach kite string (string must reach above top of kite).

3 attach kite tails.

4 decorate by copying the design on the sample kite exactly.

Repeat steps 1-5, making two kites at a time until the 7th kite.

QUALITY STANDARD

. kite folded evenly,

. kite string and tails attached in correct place,

. kite string is slightly longer than the top of the kite,

. kite decoration is a close copy of the sample kite.

FEEDBACK SHEET

The time sheet is to be completed so the experimentor can ensure the required pace is being maintained.

Completed kite's (number)	Time Expected (minutes)	Time taken
2	8.6	.....
4	17	.....
6	25.7	.....
7	30	.....
.....		.....
.....		.....

REST BREAK

a) You are not permitted to have a rest break.

b) You have been allocated a one minute rest break.

This must be taken at the time indicated below.

Time of rest break: _____

APPENDIX A (VI)

TASK INSTRUCTIONS:

HIGH-CONTROL/ LOW-DEMAND CONDITION

N.B. Both high-control conditions were provided with the feedback sheet included here.

TASK INSTRUCTIONS

Aim to complete 3 kites in 30 minutes.

Make at least 2 different kites. These may be selected from the guide sheet, or make your own design.

Kites can be made in any order.

Each kite is to be decorated with your choice of design.

Each kite must have a tail attached, and kite string tied.

The kite string must reach above the top of the kite.

QUALITY STANDARD

- kite folded evenly,
- kite string and tails attached in correct place,
- kite string is slightly longer than the top of the kite,
- kite is decorated.

FEEDBACK SHEET

The time sheet is designed to provide feedback and assist you to achieve your goal.

Completed kite/s	Time taken
.....	.....
.....	.....
.....	.....
.....	.....
.....	.....
.....	.....
.....	.....
.....	.....

REST BREAK

Did you have a rest break? yes no

If yes, time when taken: _____

APPENDIX A (VII)

TASK INSTRUCTIONS:

HIGH-CONTROL/ HIGH-DEMAND

CONDITION

TASK INSTRUCTIONS

7 kites are to be completed in 30 minutes.

Make at least 4 different kites. These may be selected from the guide sheet, or make your own design.

Kites can be made in any order.

Each kite is to be decorated with your choice of design.

Each kite must have a tail attached, and kite string tied.

The kite string must reach above the top of the kite.

QUALITY STANDARD

- kite folded evenly,
- kite string and tails attached in correct place,
- kite string is slightly longer than the top of the kite,
- kite is decorated.

APPENDIX B

QUESTIONNAIRE MEASURES

SELF-EVALUATION QUESTIONNAIRE

ENDIX B (I)

Developed by Charles D. Spielberger
in collaboration with
R. L. Gorsuch, R. Lushene, P. R. Vagg, and G. A. Jacobs

STAI Form Y-1

lame _____ Date _____ S ____

ıge _____ Sex: M ____ F ____. T ____

IRECTIONS: A number of statements which people have used to escribe themselves are given below. Read each statement and then lacken in the appropriate circle to the right of the statement to indiıte how you feel *right* now, that is, *at this moment*. There are no right r wrong answers. Do not spend too much time on any one statement ut give the answer which seems to describe your present feelings best.

	NOT AT ALL	SOMEWHAT	MODERATELY SO	VERY MUCH SO
1. I feel calm	①	②	③	④
2. I feel secure	①	②	③	④
3. I am tense	①	②	③	④
4. I feel strained	①	②	③	④
5. I feel at ease	①	②	③	④
6. I feel upset	①	②	③	④
7. I am presently worrying over possible misfortunes	①	②	③	④
8. I feel satisfied	①	②	③	④
9. I feel frightened	①	②	③	④
0. I feel comfortable	①	②	③	④
1. I feel self-confident	①	②	③	④
2. I feel nervous	①	②	③	④
3. I am jittery	①	②	③	④
4. I feel indecisive	①	②	③	④
5. I am relaxed	①	②	③	④
6. I feel content	①	②	③	④
7. I am worried	①	②	③	④
8. I feel confused	①	②	③	④
9. I feel steady	①	②	③	④
0. I feel pleasant	①	②	③	④

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APPENDIX B (II)

Manipulation check TASK QUESTIONNAIRE

DIRECTIONS: A number of statements relevant to work situations are given below. Read each statement and then circle the number below the statement which best describes your experience of the kite-making task.

1. I was given free choice in how to assemble my work.

1	2	3	4	5	6	7
Strongly disagree	Disagree	Slightly disagree	Undecided	Slightly agree	Agree	Strongly agree

2. I had too much work to do everything well.

1	2	3	4	5	6	7
Strongly disagree	Disagree	Slightly disagree	Undecided	Slightly agree	Agree	Strongly agree

3. I was given a lot of freedom to decide how I did my own work.

1	2	3	4	5	6	7
Strongly disagree	Disagree	Slightly disagree	Undecided	Slightly agree	Agree	Strongly agree

4. I had to work too fast.

1	2	3	4	5	6	7
Strongly disagree	Disagree	Slightly disagree	Undecided	Slightly agree	Agree	Strongly agree

5. I was not free to use my own judgement.

1	2	3	4	5	6	7
Strongly disagree	Disagree	Slightly disagree	Undecided	Slightly agree	Agree	Strongly agree

6. I had time to think and contemplate.

1	2	3	4	5	6	7
Strongly disagree	Disagree	Slightly disagree	Undecided	Slightly agree	Agree	Strongly agree

7. I was asked to do excessive amounts of work.

1	2	3	4	5	6	7
Strongly disagree	Disagree	Slightly disagree	Undecided	Slightly agree	Agree	Strongly agree

8. I had the chance to try my own methods of doing the job.

1	2	3	4	5	6	7
Strongly disagree	Disagree	Slightly disagree	Undecided	Slightly agree	Agree	Strongly agree

9. There was not enough time to get the job done.

1	2	3	4	5	6	7
Strongly disagree	Disagree	Slightly disagree	Undecided	Slightly agree	Agree	Strongly agree

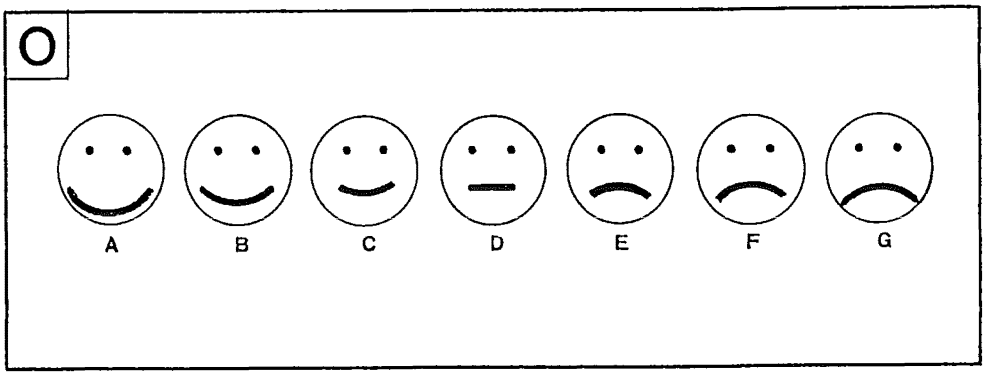
10. While kitemaking, my work was closely supervised.

1	2	3	4	5	6	7
Strongly disagree	Disagree	Slightly disagree	Undecided	Slightly agree	Agree	Strongly agree

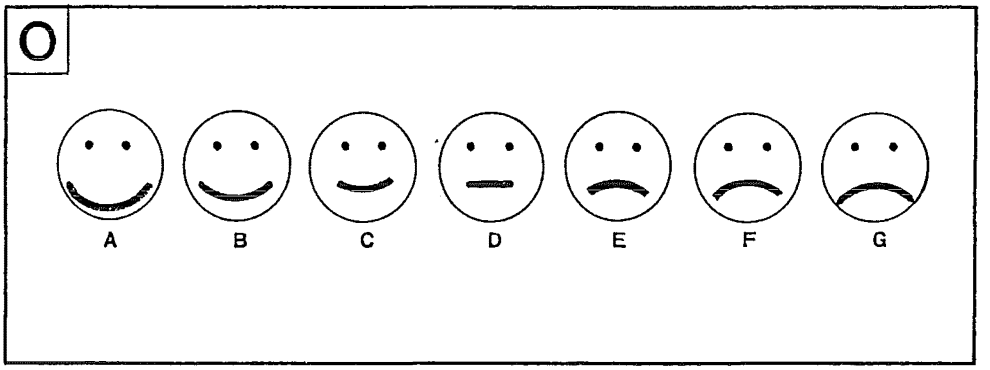
Faces satisfaction scales:

Overall and Projected FACES SCALE

1. Identify the face that best describes how you feel about the task in general.



2. Identify the face that best describes how you would rate the task after having done it for a normal working week (i.e., 40 hours).



SSD

STONE'S SEMANTIC DIFFERENTIAL (1977).

In the scale below are pairs of words which are opposite in meaning. You are asked to describe your reaction to the kite making task by placing an "X" in one of the seven spaces on the line between the two words. Each space represents how well the adjective fits the task you are describing, as in the following example:

Gloomy :_____:_____:_____ I_____I _____:_____:_____: Cheerful

Very gloomy | Gloomy | Slightly gloomy | Undecided | Slightly cheerful | Cheerful | Very cheerful

---

1. Frustrating :___:___:___ I___I ___:___:___: Gratifying
2. Satisfying :___:___:___ I___I ___:___:___: Dissatisfying
3. Boring :___:___:___ I___I ___:___:___: Interesting
4. Good :___:___:___ I___I ___:___:___: Bad
5. Liked :___:___:___ I___I ___:___:___: Disliked
6. Pleasant :___:___:___ I___I ___:___:___: Unpleasant
7. Nice :___:___:___ I___I ___:___:___: Awful
8. Sad :___:___:___ I___I ___:___:___: Happy
9. Pleasurable :___:___:___ I___I ___:___:___: Painful
10. Pleasing :___:___:___ I___I ___:___:___: Annoying

APPENDIX B (V)

JDI

WORK SCALE

1. Think of the kite task. What was it like most of the time?

In the blank beside each word given below, write

_Y_ for "Yes" if it describes your work

_N_ for "No" if it does NOT describe it

_?_ if you cannot decide.

Work on present job:

____ Routine

____ Fascinating

____ Satisfying

____ Boring

____ Good

____ Creative

____ Respected

____ Hot

____ Pleasant

____ Useful

____ Tiresome

____ Healthful

____ Challenging

____ On your feet

____ Frustrating

____ Simple

____ Endless

____ Gives sense of accomplishment

APPENDIX C: MEANS AND STANDARD DEVIATIONS

a) Mean ratings of objective variables for subjective control, demand and change in anxiety.

DEMAND	SEX	SUBJECTIVE				ANXIETY	
		Control		Demand			
		Mean	SD	Mean	SD	Mean	SD
		LOW CONTROL					
LOW	F	15.3	(4.7)	17.9	(7.3)	3.1	(9.9)
	M	14.9	(6.0)	21	(6.8)	4.2	(6.7)
HIGH	F	14.3	(4.6)	24.4	(5.0)	4.2	(8.5)
	M	13.7	(6.2)	27.8	(5.1)	6.9	(8.9)
		HIGH CONTROL					
LOW	F	24.7	(5.8)	17.5	(8.2)	-3.0	(7.9)
	M	27.2	(5.1)	21.2	(6.9)	-0.78	(7.0)
HIGH	F	26.1	(3.9)	27.8	(4.3)	-0.37	(7.4)
	M	23.0	(6.2)	29.2	(3.1)	6.1	(4.3)
		SAMPLE					
		20.0	(7.4)	22.8	(7.4)	1.98	(8.4)

b) **Mean ratings for objective satisfaction measures.**

DEMAND	SEX	SATISFACTION MEASURES							
		overall~		Projected~		Semantic Differential. ~~		Job Descriptive Index~~~	
		Mean	SD	Mean	SD	Mean	SD	Mean	SD
		LOW CONTROL							
LOW	F	5.3	1.3	2.3	1.7	47.6	12.9	32.4	7.5
	M	5	0.9	1.9	0.9	44.8	12	22	11
HIGH	F	4.95	1	1.95	1.2	48.8	8.7	30.5	9.2
	M	4.9	1.1	2.6	1.9	42.3	9.9	29	15.5
		HIGH CONTROL							
LOW	F	6	0.75	3.7	1.9	55.4	6.3	36.5	7.2
	M	5.2	0.97	3.1	1.7	50.3	11.7	33.8	12.6
HIGH	F	4.8	0.96	2.7	1.9	51.1	8.5	34	9.7
	M	4.3	1.2	1.6	0.53	45.3	7.6	29.8	5.5
		SAMPLE							
		5.1	1.1	2.6	1.7	49.1	10	31.9	10

~ Ratings on a 7 - point, 1 - item scale; "7" most satisfaction.
~~ Ratings on a 7 - point, 10 - item scale; "7" most satisfaction.
~~~ Ratings on a 3 - point, 20 - item scale; "0" least satisfaction and "3" most satisfaction.
~~~

c) **Perceived analysis: means and standard deviations for anxiety and satisfaction measures.**

DEMANDS		ANXIETY		SATISFACTION MEASURES							
				Overall		Projected		Semantic Differential		Job Descriptive Index	
	SEX n	Mean (M)	SD	M	SD	M	SD	M	SD	M	SD
	LOW CONTROL										
LOW	F 23	-.35	9.1	5.3	1.2	2.6	1.6	49.4	11.9	32.4	8.97
	M 6	3.17	7.55	5.17	.75	1.67	1.03	44.3	7.4	23.8	10.7
HIGH	F 16	7.38	9.04	4.69	.95	2.19	1.38	44.6	8.95	30.5	8.6
	M 11	6.73	7.8	4.64	1.2	1.73	.65	42.6	12.3	25.9	13
	HIGH CONTROL										
LOW	F 20	-.65	6.3	5.9	.91	3.15	2.3	56	5.8	36.8	6.5
	M 7	1.29	7.3	5.4	7.87	3.57	2.4	47.4	12.5	34.1	15
HIGH	F 17	-1.4	8.4	5.06	.97	2.7	1.69	52.1	7.3	33.5	9.5
	M 12	3.88	6.8	4.58	1.08	2.3	1.15	48.4	8.6	30.3	9.5
	SAMPLE										
	112	1.98	8.4	5.14	1.1	2.55	1.7	49.1	10.1	31.9	10

APPENDIX D: ANOVA SUMMARY TABLES

I OBJECTIVE ANALYSIS

a) ANOVA SUMMARY TABLE: MANIPULATED CONTROL

Effect	SS	df	MS	F	P	% VAR
Control (A)	2793.16	1	2793.16	104.88	.0000	48.98
Demand (B)	39.34*	1	39.34	1.477	.225	.68
Gender (C)	3.86	1	3.86	.145	.705	.01
A x B	.609	1	.61	.023	.853	.01
A x C	.481	1	.48	.018	.863	.008
B x C	51.59	1	51.59	1.937	.1634	.9
A x B x C	44.0	1	44.0	1.65	.1986	.77
within	2769.71	104	26.6			48.57
Total	5702.75	111				100.

b) ANOVA SUMMARY TABLE: MANIPULATED DEMAND

Effect	SS	df	MS	F	P	% VAR
Control (A)	33.250	1	33.250	.86379	.35761	.57
Demand (B)	1511.299	1	1511.299	39.26138	.00000	26.0
Gender (C)	208.856	1	208.856	5.42577	.02053	3.59
A x B	37.547	1	37.547	.97542	.32711	.65
A x C	2.714	1	2.714	.07052	.78073	.05
B x C	5.549	1	5.549	.14417	.70537	.1
A x B x C	9.654	1	9.654	.25081	.62347	.17
within	4003.299	104	38.493			69.0
Total	5812.12	111				

c) TASK SATISFACTION: OBJECTIVE ANALYSIS

i) ANOVA SUMMARY TABLE: Overall- Satisfaction

Effect	SS	df	MS	F	P	% VAR
Control (A)	.0921	1	.09211	.08707	.76153	.07
Demand (B)	9.7444	1	9.74435	9.21089	.00338	7.49
Gender (C)	4.2114	1	4.21135	3.98080	.04582	3.25
A x B	3.7502	1	3.75021	3.54490	.05921	2.9
A x C	1.2707	1	1.27068	1.20111	.27508	.98
B x C	.4229	1	.42293	.39978	.53575	3.3
A x B x C	.0002	1	.00021	.00020	.93667	.00
within	110.0234	104	1.05792			84.95
Total	129.5	111				

ii) ANOVA SUMMARY TABLE: Projected Satisfaction

Effect	SS	df	MS	F	P	% VAR
Control (A)	9.0359	1	9.03592	3.49808	.06089	2.89
Demand (B)	7.7797	1	7.77966	3.01174	.08182	2.5
Gender (C)	4.0353	1	4.03530	1.56219	.21160	1.3
A x B	12.4344	1	12.43441	4.81374	.02860	3.98
A x C	6.0359	1	6.03592	2.33669	.12542	1.93
B x C	.3511	1	.35108	.13591	.71276	.1125
A x B x C	3.8630	1	3.86299	1.49548	.22186	1.24
within	268.6433	104	2.58311			86.05
Total	312.18	111				

iii) ANOVA SUMMARY TABLE: Stones Semantic Differential

Effect	SS	df	MS	F	P	% VAR
Control (A)	528.674	1	528.6738	5.58947	.01882	4.7
Demand (B)	169.925	1	169.9251	1.79656	.17977	1.51
Gender (C)	611.429	1	611.4288	6.46441	.01201	5.42
A x B	99.725	1	99.7251	1.05436	.30758	.88
A x C	3.422	1	3.4219	.03618	.82857	.03
B x C	28.747	1	28.7473	.30393	.58940	.26
A x B x C	13.475	1	13.4746	.14246	.70688	.12
within	9836.715	104	94.5838			87.11

iv) ANOVA SUMMARY TABLE: Job Descriptive Index

Effect	SS	df	MS	F	P	% VAR
Control (A)	628.701	1	628.7011	6.82773	.01003	5.6
Demand (B)	2.047	1	2.0471	.02223	.85390	.02
Gender (C)	555.589	1	555.5894	6.03373	.01494	4.9
A x B	197.323	1	197.3235	2.14294	.14240	1.76
A x C	35.452	1	35.4521	.39501	.54345	.32
B x C	78.226	1	78.2258	.84954	.36177	.70
A x B x C	172.574	1	172.5736	1.87416	.17050	1.54
within	9576.373	104	92.0805			85.15
Total	11246.26	111				

d) AGE OBJECTIVE ANALYSIS: ANOVA SUMMARY TABLE

Effect	SS	df	MS	F	P	% VAR
Control (A)	238.226	1	238.2256	9.00497	.00369	7.6
Demand (B)	.423	1	.4229	.01599	.86763	.014
Gender (C)	21.790	1	21.7896	.82365	.36949	.70
A x B	33.752	1	33.7518	1.27582	.26020	1.08
A x C	5.083	1	5.0826	.19212	.66581	.16
B x C	31.280	1	31.2801	1.18239	.27898	.10
A x B x C	55.609	1	55.6089	2.10203	.14631	1.77
within	2751.310	104	26.4549			87.7
Total	3137.5	111				

e) ANXIETY OBJECTIVE ANALYSIS: ANOVA SUMMARY TABLE

Effect	SS	df	MS	F	P	% VAR
Control (A)	411.113	1	411.1132	6.35923	.01266	5.3
Demand (B)	271.905	1	271.9043	4.20591	.04025	3.5
Gender (C)	240.461	1	240.4613	3.71953	.05339	3.09
A x B	49.534	1	49.5340	.76621	.38744	.64
A x C	35.970	1	35.9700	.55640	.46405	.46
B x C	50.762	1	50.7620	.78520	.38138	.65
A x B x C	11.534	1	11.5340	.17841	.67659	.15
within	6723.418	104	64.6483			86.3
Total	3137.47	111				

f) PULSE RATE: OBJECTIVE ANALYSIS

i) ANOVA SUMMARY OF ALL EFFECTS

Effect	df	MS	df	MS	F	P
Control (1)	1	134.667	104	799.622	0.16841	0.68471
Demand (2)	1	681.002	104	799.622	0.85166	0.36114
Gender (3)	1	444.897	104	799.622	0.55638	0.46406
Time (4)	6	112.860	624	15.3160	7.36875	0.00000
1 2	1	446.280	104	799.622	0.55811	0.46334
1 3	1	668.800	104	799.622	0.83640	0.36566
2 3	1	177.707	104	799.622	0.22224	0.64338
1 4	6	13.9281	624	15.3160	0.90938	0.48872
2 4	6	10.0422	624	15.3160	0.65566	0.68795
3 4	6	20.3391	624	15.3160	1.32796	0.24139
1 2 3	1	3019.26	104	799.622	3.77586	0.05165
1 2 4	6	19.6750	624	15.3160	1.28460	0.26120
1 3 4	6	21.9587	624	15.3160	1.43338	0.19840
2 3 4	6	9.12725	624	15.3160	0.59593	0.73595
1 2 3 4	6	33.4641	624	15.3160	2.18490	0.04226

ii) PULSE RATE: MAIN EFFECTS AND INTERACTIONS.

Independent Variables	F STATISTIC
Control	0.17
Demand	0.85
Gender	0.56
Time	7.37^{***}
Control x Demand x Gender	3.78 (p = .052)
Control x Demand x Gender x Time	2.185^{*}

ii) Time: planned comparisons.

Comparison	F
Base x 5 minutes	16.02***
5 x 20 minutes	4.3*
20 x 25 minutes	9.57**
25 x 30 minutes	1.6
Base x 20 minutes	5.15*

*** P < .001
** P < .01
* P < .05

II PERCEIVED ANALYSIS: ANOVA SUMMARY TABLES

a) PERCEIVED SATISFACTION

i) Overall Satisfaction - Stone's Faces Scale

Effect	SS	df	MS	F	P	% VAR
Control (A)	1.9792	1	1.97924	1.85346	.17292	1.55
Demand (B)	11.4986	1	11.49362	10.76313	.00179	9.0
Gender (C)	1.8465	1	1.84648	1.72914	.18831	1.45
A x B	.4163	1	.41629	.38983	.54091	.33
A x C	.8227	1	.82271	.77042	.38608	.65
B x C	.0097	1	.00974	.00912	.88618	.01
A x B x C	.0018	1	.01175	.01100	.88056	.00
within	111.058	104	1.06787			87.0
Total	127.633	111				

ii) Projected Satisfaction

Effect	SS	df	MS	F	P	% VAR
Control A)	18.2495	1	18.24953	6.54711	.01152	5.4
Demand (B)	9.9737	1	5.97371	2.14310	.14239	3.0
Gender (C)	2.6220	1	2.62198	.94065	.33623	.78
A x B	2.5004	1	2.50039	.89703	.34815	.74
A x C	3.0145	1	3.01445	1.08145	.30123	.9
B x C	.1395	1	.13951	.05005	.80752	.04
A x B x C	2.3299	1	2.32993	.83587	.36582	.69
within	298.8913	104	2.78742			88.5
Total	337.7	111				

iii) Stone's Semantic Differential

Effect	SS	df	MS	F	P	% VAR
Control (A)	777.5212	1	777.5212	8.65912	.00429	7.1
Demand (B)	131.907	1	131.9068	1.46902	.22609	1.2
Gender (C)	540.748	1	540.7480	6.02222	.01503	5.0
A x B	21.894	1	21.8937	.24383	.62822	.2
A x C	35.917	1	35.9175	.40001	.53563	.33
B x C	83.470	1	83.4705	.92960	.33920	.76
A x B x C	5.754	1	5.7537	.06408	.78874	.05
within	9338.383	104	89.7921			85.4
Total	10935.6	111				

iv) Job Descriptive Index

Effect	SS	df	MS	F	P	% VAR
Control (A)	697.792	1	697.7921	7.44854	.00744	6.22
Demand (B)	67.939	1	67.9394	.72521	.40097	.61
Gender (C)	516.531	1	516.5313	5.51368	.01959	4.6
A x B	73.614	1	73.6144	.78579	.38119	.66
A x C	78.159	1	78.1592	.83430	.36628	.70
B x C	16.759	1	16.7593	.17890	.67621	1.49
A x B x C	30.284	1	30.2837	.32326	.57784	.27
Within	9742.902	104	93.6818			86.8
Total	11223.96	111				

b) AGE: PERCEIVED ANALYSIS

Effect	SS	df	MS	F	P	% VAR
Control (A)	27.081	1	27.08	.92027	.34173	.84
Demand (B)	89.858	1	89.86	3.05355	.07974	2.78
Gender (C)	5.713	1	5.71	.19415	.66425	.18
A x B	16.365	1	16.37	.55612	.46416	.51
A x C	29.338	1	29.34	.99697	.32162	.91
B x C	4.635	1	4.64	.15752	.69380	.12
A x B x C	3.883	1	3.88	.13195	.71638	.12
within	3060.451	104	29.43			94.5
Total	3237.32					

c) ANXIETY: PERCEIVED ANALYSIS

i) Anxiety (gender included)

Effect	SS	df	MS	F	P	% VAR
Control (A)	272.813	1	272.8125	4.24642	.03933	3.6
Demand (B)	246.715	1	246.7151	3.34020	.04973	3.3
Gender (C)	142.828	1	142.8280	2.22317	.13507	1.9
A x B	127.533	1	127.5325	1.98509	.15819	1.6
A x C	25.920	1	25.9201	.40345	.53386	.34
B x C	1.190	1	1.1897	.01852	.86181	.02
A x B x C	78.660	1	78.6599	1.22437	.27034	1.04
within	6681.513	104	64.2453			81.18
Total	7577.16	111				

ii) Anxiety (without gender)

Effect	SS	df	MS	F	P	% VAR
Control (A)	327.604	1	327.6045	5.08961	.02452	4.1
Demand (B)	411.6045	1	411.6045	6.39463	.01239	5.2
A x B	234.414	1	234.4140	3.64182	.05579	3.0
within	6951.663	108	64.3672			87.7
Total	7925.3	111				